Tranquility® Modular

(TRM) Vertical Stack Series

Commercial
Vertical Stack
Water-Source Heat Pumps

Installation, Operation
& Maintenance

97B0056N01
Revised: 09 November, 2012

CLIMATEMASTER®
Water-Source Heat Pump Systems

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Vertical Stack

Rev.: 11/09/12

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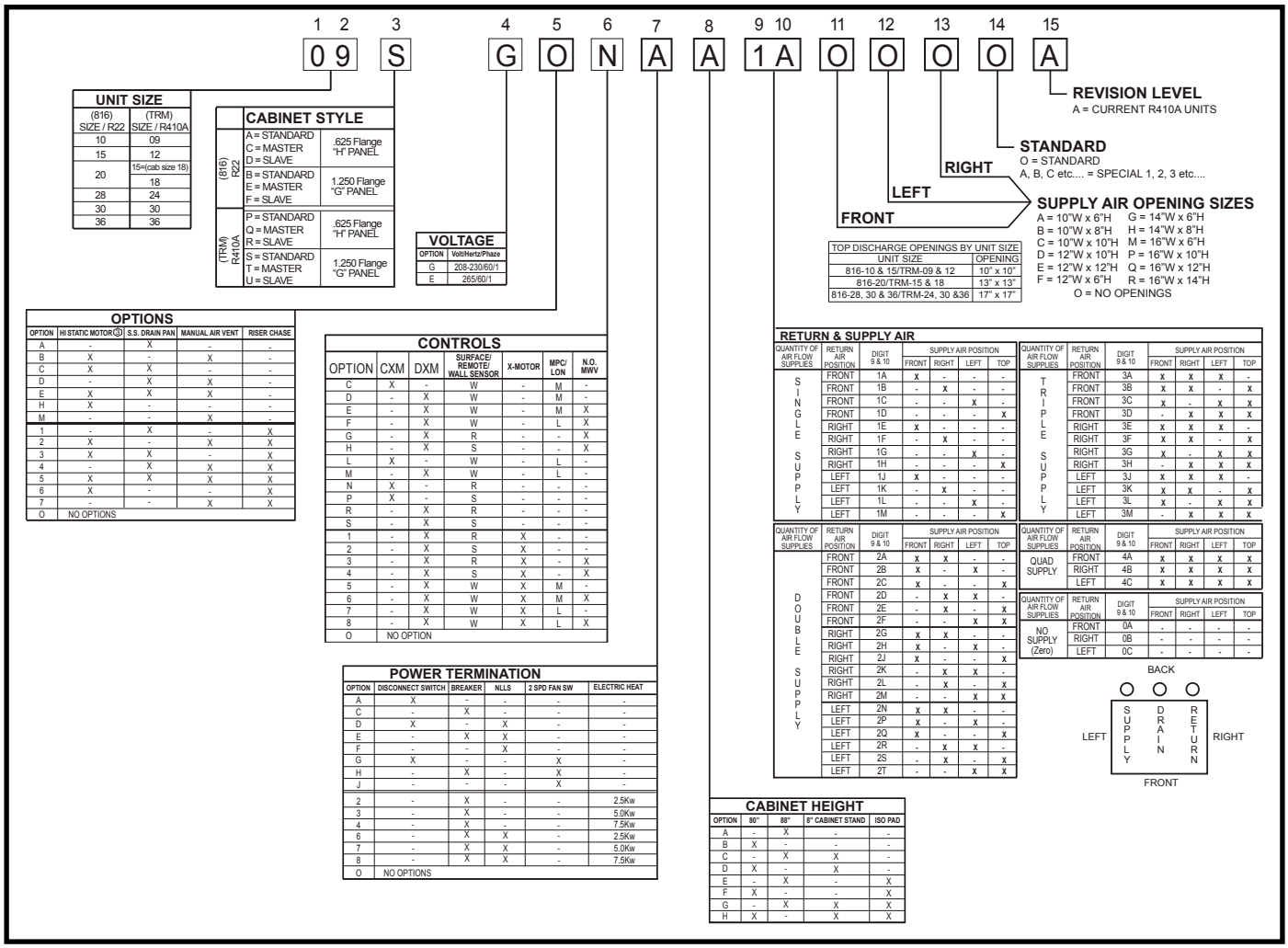
TRM Model Nomenclature


1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
0 9 S G O N A A 1 A O O O O A
REVISION LEVEL
A = CURRENT R410A UNITS
STANDARD
O = STANDARD
A, B, C etc.... = SPECIAL 1, 2, 3 etc....
RIGHT
LEFT
FRONT
SUPPLY AIR OPENING SIZES
A = 10"W x 6"H G = 14"W x 6"H
B = 10"W x 8"H H = 14"W x 8"H
C = 10"W x 10"H M = 16"W x 6"H
D = 12"W x 10"H P = 16"W x 10"H
E = 12"W x 12"H Q = 16"W x 12"H
F = 12"W x 6"H R = 16"W x 14"H
O = NO OPENINGS
BACK
LEFT
RIGHT
FRONT
SUPPLY
DRAIN
RETURN

UNIT SIZE

(816) SIZE / R22	(TRM) SIZE / R410A
10	09
15	12
20	15=(cab size 18)
	18
28	24
30	30
36	36

CABINET STYLE

(816) R22	A = STANDARD C = MASTER D = SLAVE	.625 Flange "H" PANEL
	B = STANDARD E = MASTER F = SLAVE	1.250 Flange "G" PANEL
(TRM) R410A	P = STANDARD Q = MASTER R = SLAVE	.625 Flange "H" PANEL
	S = STANDARD T = MASTER U = SLAVE	1.250 Flange "G" PANEL

VOLTAGE

OPTION	Volt/Hertz/Phaze
G	208-230/60/1
E	265/60/1

OPTIONS

OPTION	HI STATIC MOTOR ①	S.S. DRAIN PAN	MANUAL AIR VENT	RISER CHASE
A	-	X	-	-
B	X	-	X	-
C	X	X	-	-
D	-	X	X	-
E	X	X	X	-
H	X	-	-	-
M	-	-	X	-
1	-	X	-	X
2	X	-	X	X
3	X	X	-	X
4	-	X	X	X
5	X	X	X	X
6	X	-	-	X
7	-	-	X	X
O	NO OPTIONS			

CONTROLS

OPTION	CXM	DXM	SURFACE/ REMOTE/ WALL SENSOR	X-MOTOR	MPC/ LON	N.O. MWV
C	X	-	W	-	M	-
D	-	X	W	-	M	-
E	-	X	W	-	M	X
F	-	X	W	-	L	X
G	-	X	R	-	-	X
H	-	X	S	-	-	X
L	X	-	W	-	L	-
M	-	X	W	-	L	-
N	X	-	R	-	-	-
P	X	-	S	-	-	-
R	-	X	R	-	-	-
S	-	X	S	-	-	-
1	-	X	R	X	-	-
2	-	X	S	X	-	-
3	-	X	R	X	-	X
4	-	X	S	X	-	X
5	-	X	W	X	M	-
6	-	X	W	X	M	X
7	-	X	W	X	L	-
8	-	X	W	X	L	X
O	NO OPTION					

POWER TERMINATION

OPTION	DISCONNECT SWITCH	BREAKER	NLLS	2 SPD FAN SW	ELECTRIC HEAT
A	X	-	-	-	-
C	-	X	-	-	-
D	X	-	X	-	-
E	-	X	X	-	-
F	-	-	X	-	-
G	X	-	-	X	-
H	-	X	-	X	-
J	-	-	-	X	-
2	-	X	-	-	2.5Kw
3	-	X	-	-	5.0Kw
4	-	X	-	-	7.5Kw
6	-	X	X	-	2.5Kw
7	-	X	X	-	5.0Kw
8	-	X	X	-	7.5Kw
O	NO OPTIONS				

CABINET HEIGHT

OPTION	80"	88"	8" CABINET STAND	ISO PAD
A	-	X	-	-
B	X	-	-	-
C	-	X	X	-
D	X	-	X	-
E	-	X	-	X
F	X	-	-	X
G	-	X	X	X
H	X	-	X	X

TOP DISCHARGE OPENINGS BY UNIT SIZE

UNIT SIZE	OPENING
816-10 & 15/TRM-09 & 12	10" x 10"
816-20/TRM-15 & 18	13" x 13"
816-28, 30 & 36/TRM-24, 30 &36	17" x 17"

RETURN & SUPPLY AIR

QUANTITY OF AIR FLOW SUPPLIES	RETURN AIR POSITION	DIGIT 9 & 10	SUPPLY AIR POSITION FRONT	RIGHT	LEFT	TOP
SINGLE SUPPLY	FRONT	1A	X	-	-	-
	FRONT	1B	-	X	-	-
	FRONT	1C	-	-	X	-
	FRONT	1D	-	-	-	X
	RIGHT	1E	X	-	-	-
	RIGHT	1F	-	X	-	-
	RIGHT	1G	-	-	X	-
	RIGHT	1H	-	-	-	X
	LEFT	1J	X	-	-	-
	LEFT	1K	-	X	-	-
	LEFT	1L	-	-	X	-
	LEFT	1M	-	-	-	X
DOUBLE SUPPLY	FRONT	2A	X	X	-	-
	FRONT	2B	X	-	X	-
	FRONT	2C	X	-	-	X
	FRONT	2D	-	X	X	-
	FRONT	2E	-	X	-	X
	FRONT	2F	-	-	X	X
	RIGHT	2G	X	X	-	-
	RIGHT	2H	X	-	X	-
	RIGHT	2J	X	-	-	X
	RIGHT	2K	-	X	X	-
	RIGHT	2L	-	X	-	X
	RIGHT	2M	-	-	X	X
	LEFT	2N	X	X	-	-
	LEFT	2P	X	-	X	-
	LEFT	2Q	X	-	-	X
	LEFT	2R	-	X	X	-
	LEFT	2S	-	X	-	X
	LEFT	2T	-	-	X	X
TRIPLE SUPPLY	FRONT	3A	X	X	X	-
	FRONT	3B	X	X	-	X
	FRONT	3C	X	-	X	X
	FRONT	3D	-	X	X	X
	RIGHT	3E	X	X	X	-
	RIGHT	3F	X	X	-	X
	RIGHT	3G	X	-	X	X
	RIGHT	3H	-	X	X	X
	LEFT	3J	X	X	X	-
	LEFT	3K	X	X	-	X
	LEFT	3L	X	-	X	X
	LEFT	3M	-	X	X	X
QUAD SUPPLY	FRONT	4A	X	X	X	X
	RIGHT	4B	X	X	X	X
	LEFT	4C	X	X	X	X
NO SUPPLY (Zero)	FRONT	0A	-	-	-	-
	RIGHT	0B	-	-	-	-
	LEFT	0C	-	-	-	-

TRM Model Nomenclature - Chassis

Chassis

1	2	3	4	5	6	7	8	9	10	11	12
T	R	M	0	9	G	S	S	S	C	S	A

Series
TRM = Tranquility® High Rise Chassis

Unit Size
09, 12, 15, 18, 24, 30, 36

Voltage
G = 208-230/60/1
E = 265/60/1

Options*

OPTION	S.S. Drain Pan	MUTE	AST008 RAS	AST009 RAS
A	X	-	-	-
B	-	-	-	X
C	X	-	-	X
D	-	-	X	-
E	X	-	X	-
1	-	X	-	-
2	X	X	-	-
3	-	X	-	X
4	X	X	-	X
5	-	X	X	-
6	X	X	X	-
S	-	-	-	-

* - TRM Only available with P Control

Water Valve & Pump Option
S = No Water valve
M = Normally Closed Water Valve
P = Secondary Circulating Pump

Auto Flow Regulator

	5/8 SWEAT		7/8 SWEAT				
	UNIT 09	UNIT 12	UNIT 15	UNIT 18	UNIT 24	UNIT 30	UNIT 36
C	1.5	-	-	-	-	-	-
D	2.0	2.0	-	-	-	-	--
E	2.5	2.5	2.5	-	-	-	-
F	3.0	3.0	3.0	3.0	-	-	-
G	-	3.5	3.5	3.5	-	-	-
H	-	-	4.0	4.0	4.0	-	-
J	-	-	-	5.0	5.0	5.0	-
K	-	-	-	-	6.0	6.0	6.0
L	-	-	-	-	7.0	7.0	7.0
M	-	-	-	-	-	8.0	8.0
N	-	-	-	-	-	-	9.0
P	-	-	-	-	-	-	10.0

S = STANDARD - NO FLOW REGULATOR

Revision Level
A = 24, 30, 36
B = 09, 12, 15, 18

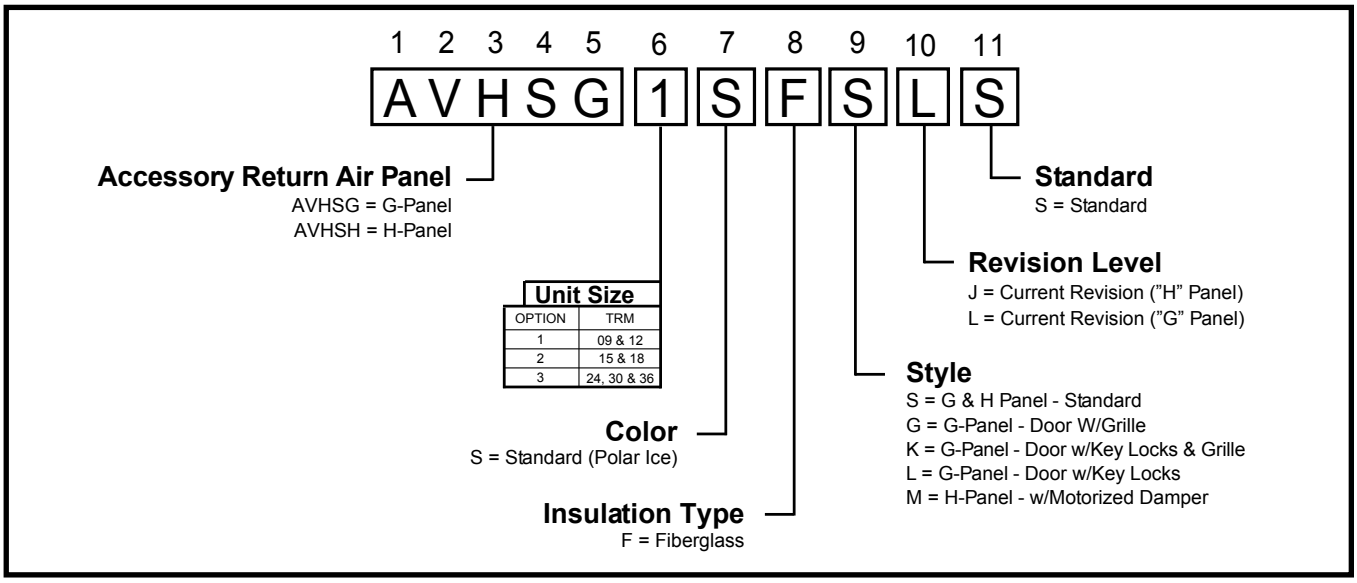
Standard
S = Standard

Heat Exchanger Options

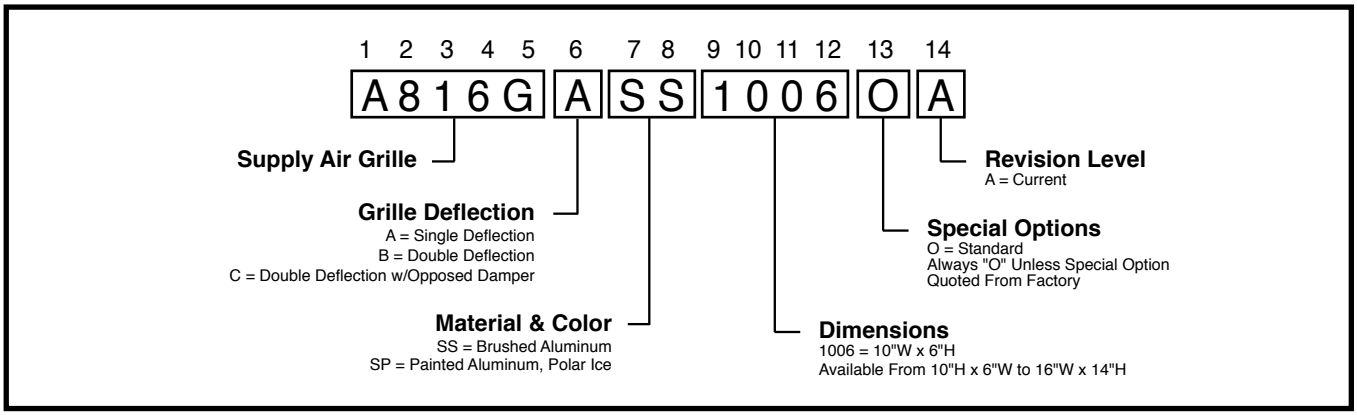
	Non Coated Air Coil		Coated Air Coil	
	Copper	Cupro-nickel	Copper	Cupro-nickel
Standard	L	M	C	N
Extended Range	F	G	D	E

Accessory Nomenclature

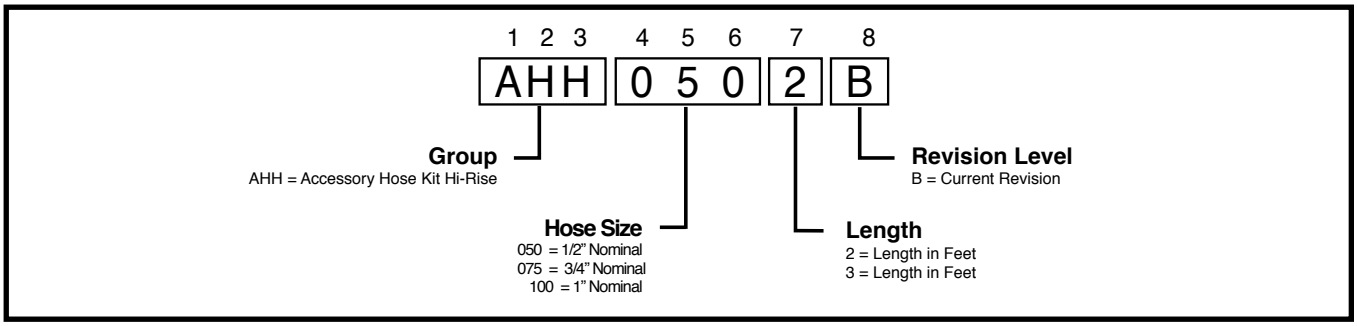
Return Air Panel


1 2 3 4 5 6 7 8 9 10 11
A V H S G 1 S F S L S
Accessory Return Air Panel
AVHSG = G-Panel
AVHSH = H-Panel
Unit Size
OPTION | TRM
1 | 09 & 12
2 | 15 & 18
3 | 24, 30 & 36
Color
S = Standard (Polar Ice)
Insulation Type
F = Fiberglass
Style
S = G & H Panel - Standard
G = G-Panel - Door W/Grille
K = G-Panel - Door w/Key Locks & Grille
L = G-Panel - Door w/Key Locks
M = H-Panel - w/Motorized Damper
Revision Level
J = Current Revision ("H" Panel)
L = Current Revision ("G" Panel)
Standard
S = Standard

Supply Air Grille


1 2 3 4 5 6 7 8 9 10 11 12 13 14
A 8 1 6 G A S S 1 0 0 6 O A
Supply Air Grille
Grille Deflection
A = Single Deflection
B = Double Deflection
C = Double Deflection w/Opposed Damper
Material & Color
SS = Brushed Aluminum
SP = Painted Aluminum, Polar Ice
Dimensions
1006 = 10"W x 6"H
Available From 10"H x 6"W to 16"W x 14"H
Special Options
O = Standard
Always "O" Unless Special Option
Quoted From Factory
Revision Level
A = Current

Hose Kit


1 2 3 4 5 6 7 8
AHH 0 5 0 2 B
Group
AHH = Accessory Hose Kit Hi-Rise
Hose Size
050 = 1/2" Nominal
075 = 3/4" Nominal
100 = 1" Nominal
Length
2 = Length in Feet
3 = Length in Feet
Revision Level
B = Current Revision

General Information

Safety

Warnings, cautions, and notices appear throughout this manual. Read these items carefully before attempting any installation, service, or troubleshooting of the equipment.

DANGER: Indicates an immediate hazardous situation, which if not avoided will result in death or serious injury. DANGER labels on unit access panels must be observed.

WARNING: Indicates a potentially hazardous situation, which if not avoided could result in death or serious injury.

⚠ WARNING! ⚠

WARNING! Verify refrigerant type before proceeding. Units are shipped with R-407c and HFC-410A (EarthPure®) refrigerants. The unit label will indicate which refrigerant is provided. The EarthPure® Application and Service Manual should be read and understood before attempting to service refrigerant circuits with R-407c or HFC-410A.

⚠ WARNING! ⚠

WARNING! To avoid the release of refrigerant into the atmosphere, the refrigerant circuit of this unit must be serviced only by technicians who meet local, state, and federal proficiency requirements.

⚠ WARNING! ⚠

WARNING! The installation of water-source heat pumps and all associated components, parts, and accessories which make up the installation shall be in accordance with the regulations of ALL authorities having jurisdiction and MUST conform to all applicable codes. It is the responsibility of the installing contractor to determine and comply with ALL applicable codes and regulations.

CAUTION: Indicates a potentially hazardous situation or an unsafe practice, which if not avoided could result in minor or moderate injury or product or property damage.

NOTICE: Notification of installation, operation, or maintenance information, which is important, but which is not hazard-related.

⚠ WARNING! ⚠

WARNING! All refrigerant discharged from this unit must be recovered WITHOUT EXCEPTION. Technicians must follow industry accepted guidelines and all local, state, and federal statutes for the recovery and disposal of refrigerants. If a compressor is removed from this unit, refrigerant circuit oil will remain in the compressor. To avoid leakage of compressor oil, refrigerant lines of the compressor must be sealed after it is removed.

⚠ CAUTION! ⚠

CAUTION! To avoid equipment damage, DO NOT use these units as a source of heating or cooling during the construction process. The mechanical components and filters will quickly become clogged with construction dirt and debris, which may cause system damage.

Inspection - Upon receipt of the equipment, carefully check the shipment against the bill of lading. Make sure all units have been received. Inspect the packaging of each unit, and inspect each unit for damage. Ensure that the carrier makes proper notation of any shortages or damage on all copies of the freight bill and completes a common carrier inspection report. Concealed damage not discovered during unloading must be reported to the carrier within 15 days of receipt of shipment. If not filed within 15 days, the freight company can deny the claim without recourse. Note: It is the responsibility of the purchaser to file all necessary claims with the carrier. Notify your equipment supplier of all damage within fifteen (15) days of shipment.

Storage - Equipment should be stored in its original packaging in a clean, dry area. Store chassis in an upright position at all times. Stack units at a maximum of 2 units high.

Store cabinets horizontally, keeping them on their pallets to protect the risers. Do not stack multipacks. Stack single cabinets at a maximum of 3 units high.

Unit Protection - Cover units on the job site with either the original packaging or an equivalent protective covering. Cap the open ends of pipes stored on the job site. In areas where painting, plastering, and/or spraying has not been completed, all due precautions must be taken to avoid physical damage to the units and contamination by foreign material. All openings in cabinet must be covered during all stages of construction. Physical damage and contamination may prevent proper start-up and may result in costly equipment clean-up.

Examine all pipes, fittings, and valves before installing any of the system components. Remove any dirt or debris found in or on these components.

Prior to flushing risers with water, be sure that the temperature in building will always be above freezing.

Pre-Installation - Installation, Operation, and Maintenance instructions are provided with each unit. The installation site chosen should include adequate service clearance around the unit. Before unit start-up, read all manuals and become familiar with the unit and its operation. Thoroughly check the system before operation.

Prepare cabinet for installation as follows:

1. Compare the electrical data on the unit nameplate with ordering and shipping information to verify that the correct unit has been shipped.
2. Each cabinet has a tag to indicate the location to be installed and the riser diameter.
3. Keep the cabinet openings and exposed sheet metal covered until installation is complete and all plastering, painting, etc. is finished.
4. Inspect all electrical connections. Connections must be clean and tight at the terminals.

Prepare chassis for installation as follows:

1. Verify refrigerant tubing is free of kinks or dents and that it does not touch other unit components.
2. Inspect all electrical connections. Connections must be clean and tight at the terminals.
3. Remove compressor shipping clips, bracket, or screws. See chasss pre-installation section for instructions.
4. If chassis is not installed in cabinet, store in original carton.

⚠ CAUTION! ⚠

CAUTION! DO NOT store or install units in corrosive environments or in locations subject to temperature or humidity extremes (e.g., attics, garages, rooftops, etc.). Corrosive conditions and high temperature or humidity can significantly reduce performance, reliability, and service life. Always move and store units in an upright position. Tilting units on their sides may cause equipment damage.

⚠ CAUTION! ⚠

CAUTION! CUT HAZARD - Failure to follow this caution may result in personal injury. Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts and servicing heat pumps.

NOTICE! Failure to remove shipping brackets from spring-mounted compressors will cause excessive noise, and could cause component failure due to added vibration.

Vertical Stack

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Riser & Cabinet Installation

⚠ WARNING! ⚠

WARNING! To avoid damage from clogged coil surfaces, clogged motor ventilation openings, seized fan blades and potential unit failure, DO NOT OPERATE UNIT without complete enclosure, supply grille, return air grille and filter in place.

⚠ CAUTION! ⚠

CAUTION! To ensure correct riser positioning and to compensate for variations in floor-to-floor dimensions, do not allow the unit to unit riser joint to bottom out.

Supply and Return Piping

1. Install a drain valve, shut-off/balancing valves, flow indicators and drain tees at the base of each supply and return riser to enable system flushing at start-up, balancing and during servicing.
2. Install strainers at the inlet of each circulating pump.
3. Insulate loop water piping which runs through nonconditioned areas or outside the building. Because loop temperature is normally between 60° F and 90° F, piping does not sweat or suffer heat loss under ambient conditions.

Condensate Piping - Condensate connection between the drain pan assembly and condensate riser is factory installed and trapped in VHS cabinet.

Riser Connections

1. **Note: Cabinet and riser assemblies are designed to accommodate a maximum of 1-½" expansion and 1-½" contraction. If the calculated riser stack expansion or contraction exceeds 1-½", expansion devices must be provided.**
2. Slab slot opening must allow for how cabinet will be set upright (see submittal). Openings should be aligned from floor to floor.

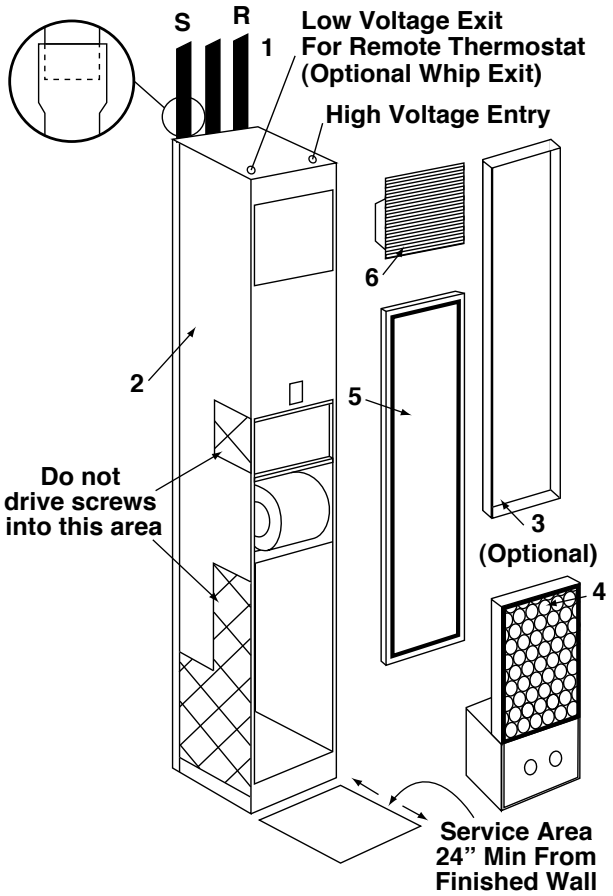
Note: All riser modifications necessitated by variations in floor-to-floor dimensions including cutting off or extending risers or modifications due to misalignment is the sole responsibility of the installing contractor.

Cabinet Installation

1. Each cabinet was ordered and built for a specific location in building. Check tag information before installing. Tag is located on bottom and lower front of cabinet. Do not remove and discard shipping brace until chassis is installed. For proper cabinet/riser installation, installer must have access to all sides.

Figure 1: Vertical Stack Unit Components

1	Supply, Return, and Condensate Risers	Install Now
2	Cabinet	
3	Optional Frame	
4	Chassis	
5	Return Air Panel	Install Later
6	Supply Air Grille	
7	Thermostat (Not shown)	
8	Hoses (Not shown)	



⚠ WARNING! ⚠

WARNING! To prevent electrical shorts and drain pan leaks, assure that screws do not penetrate unit components when driving screws near the unit control box or drain pan. Do not allow screws or nails to penetrate chassis, risers, electrical junction boxes, raceways or to interfere with chassis removal. To avoid motor or compressor damage, keep wallboard dust out of the unit.

2. Move cabinet into position. CAUTION: Keep risers off the floor while moving cabinet. Look into risers and remove any debris. From the bottom of the riser, measure up 2" and mark. See 6B.
3. Raise the cabinet upright, align it and fit 3 risers into the risers below. The top of each riser is equipped with a 3" swagged section. Insertion must be 1" minimum to 2" maximum. Modify risers or use extensions if needed.
4. Center risers in the slab opening and shim the cabinet level. Plumb risers in two planes to assure proper unit operation and condensate drainage.
5. Attach the cabinet assembly to the floor on at least two sides using sheet metal angles. If risers are secured to building structure and clamped to cabinet, mounting angles are not required. A base vibration dampening pad is recommended to help eliminate transfer of vibration to the structure. Material of 0.070 to 0.125 inches thick should be applied to the perimeter of the cabinet base. Additional anchorage can be provided by installing brackets at the top of the cabinet.
6. DO NOT attach drywall studs to cabinet. When all units on a riser are anchored into place, complete riser joints as follows:
    a. Center the horizontal supply and return runouts in the expansion slots provided in the back panel of the cabinet assembly. Assure that runouts are perpendicular to the back panel.
    b. Verify that all riser joints are vertically aligned and that risers penetrate 1" to 2" into the swaged joint of the riser below. DO NOT let riser joint bottom out.
    c. Braze riser joints with a high-temperature alloy (such as Phos-copper or Silfos). Soft solder (50-50, 60-40 or 85-15) or low-temperature alloys are NOT suitable for this application.
    d. Anchor built-in risers to the building structure with at least one contact point. To accommodate vertical expansion and contraction DO NOT fasten risers rigidly within the unit.
    e. Verify that unit shut-off valves are closed. DO NOT OPEN VALVES until the system has been cleaned and flushed.
    f. Pressure check riser - locate and repair leaks.
    g. Check condensate drain - clean pan if needed. Slowly pour 1 to 2 quarts of water into pan. Water should drain freely. check for water on floor. Note: If cabinet is slave, make sure P-Trap Hose is connected and clamped to master.
    h. Repair or replace any damaged or missing insulation on risers.
    i. To facilitate cleaning and flushing, install the hose kit at the end farthest from the pump and connect the ends of the hoses with the riser flush adapter (Kit - AFL5751). Then open both valves before pumping fresh water through the system, close the valves when the system is clean. Remove the flush adapter before installing the chassis.
    Note: Refer to System Flushing Section of this manual for more information.
    j. Install vents in piping loop as required to bleed the system of air accumulated during installation. Optional factory installed air vents may be ordered.

⚠ CAUTION! ⚠

CAUTION! ClimateMaster strongly recommends all piping connections, both internal and external to the unit, be pressure tested for leakage by an appropriate method prior to any finishing of the interior space or before access to all connections is limited. ClimateMaster will not be responsible or liable for damages from water leaks due to inadequate or a lack of pressurized leak testing during installation.

Electrical Connections - Complete all electrical connections prior to enclosing cabinet. See Electrical Section.

Optional G and H Panel Frame - Position studs in front of cabinet and install frame in opening. Seal the gap between the cabinet and the opening. If fresh air motorized damper assembly is used, field fabricate and install duct from outside to frame opening. Assembly is installed later. See instructions with assembly. NOTICE! Allow for wallboard thickness under frame front flange.

Optional Field Supplied Duct Installation - When return air is required to enter the unit through openings in a stud wall, supply and field install an optional duct. Seal duct against the return air grille. Add a blockoff above and below the chassis to ensure that all air entering the unit passes through the filter and refrigerant-to-air coil. Sheet metal ductwork must not be attached to the cabinet. A canvas type flexible connection should be used between the cabinet and the ductwork.

When supply air is ducted from unit, sheet metal ductwork must not be attached to the cabinet. A canvas-type flexible connection should be used between the cabinet and the ductwork.

Vertical Stack

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Wallboard Installation - NOTICE! If you have the surface mounted thermostat option, make sure before you install the wallboard that the 2x4 tile ring is in the correct orientation. Turn if needed. Check your thermostat.

Install studs and wallboard using conventional construction methods. Secure drywall to studs with low profile, pan-head sheet metal screws. Wallboard must not be fastened to drain pan edges or control box enclosure. Do not attach drywall studs to cabinet. Do not install wallboard using adhesive alone.

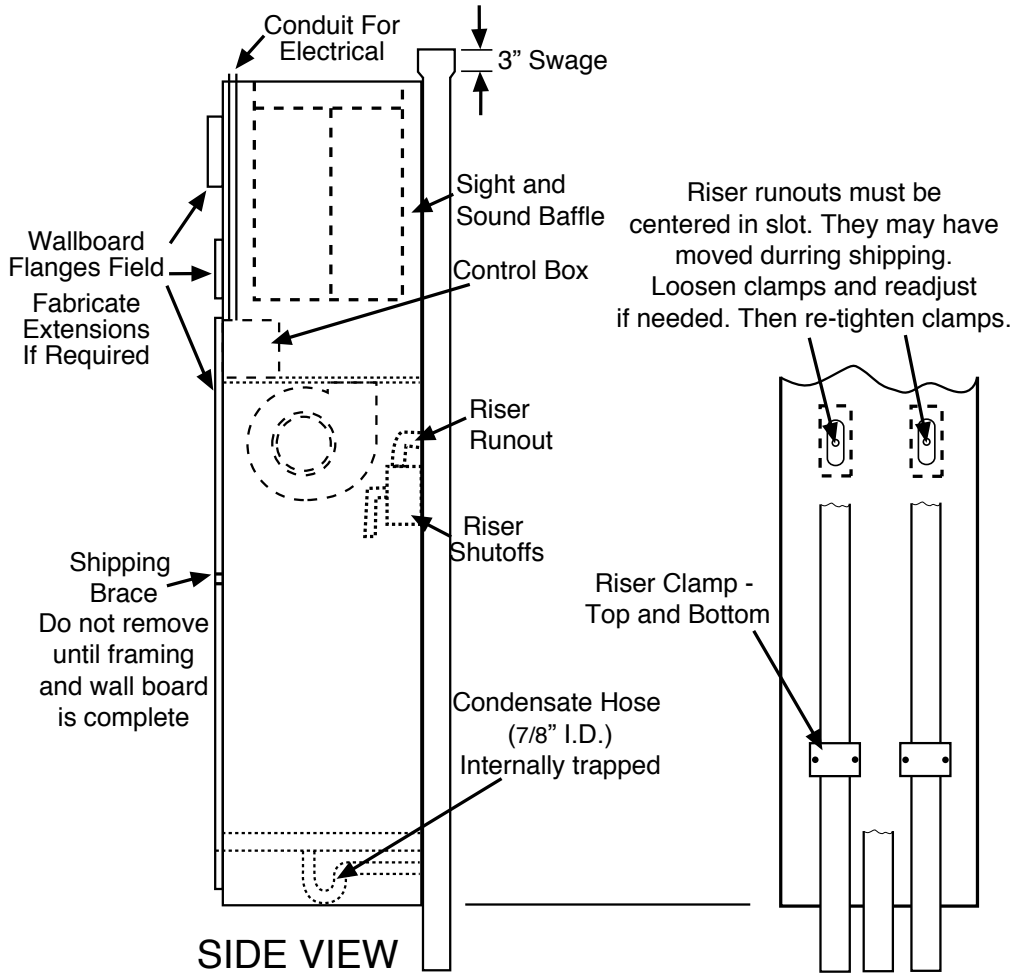
Vacuum all drywall dust and construction debris from cabinet insulation coils, drain pans and blower discharge plenum after cutting out supply and return holes for grilles. Insulation should be placed between the drywall and the cabinet for sound attenuation.

When installation is complete, cover all cabinet openings and exposed sheet metal. (Cardboard from unit shipping cartons can be used). Do not allow paint or wall texture over-spray to contact coil, fan or other unit components. Warranties are void if paint or other foreign debris is allowed to contaminate internal unit components.

Do not adjust the Sight and Sound X-baffle (see Figure 2). It is not designed to be used as a damper.

Cabinet Installation

Figure 2: Cabinet


Conduit For Electrical
3" Swage
Sight and Sound Baffle
Wallboard Flanges Field
Fabricate Extensions If Required
Control Box
Riser runouts must be centered in slot. They may have moved durring shipping. Loosen clamps and readjust if needed. Then re-tighten clamps.
Riser Runout
Riser Shutoffs
Shipping Brace Do not remove until framing and wall board is complete
Riser Clamp - Top and Bottom
Condensate Hose (7/8" I.D.) Internally trapped
SIDE VIEW

Supply Grille Installation - Cabinet opening should be sealed to wall. Use canvas-type flex collar or field supplied duct extension if needed.

Refer to Table 1 to make sure that the grille size is correct based on the type and size of the supply air grille.

- Install the grille into the cabinet discharge opening. Assure that the grille flange rests against the drywall covering the cabinet. Do not caulk.
- Secure the grille to the drywall with the screws provided.

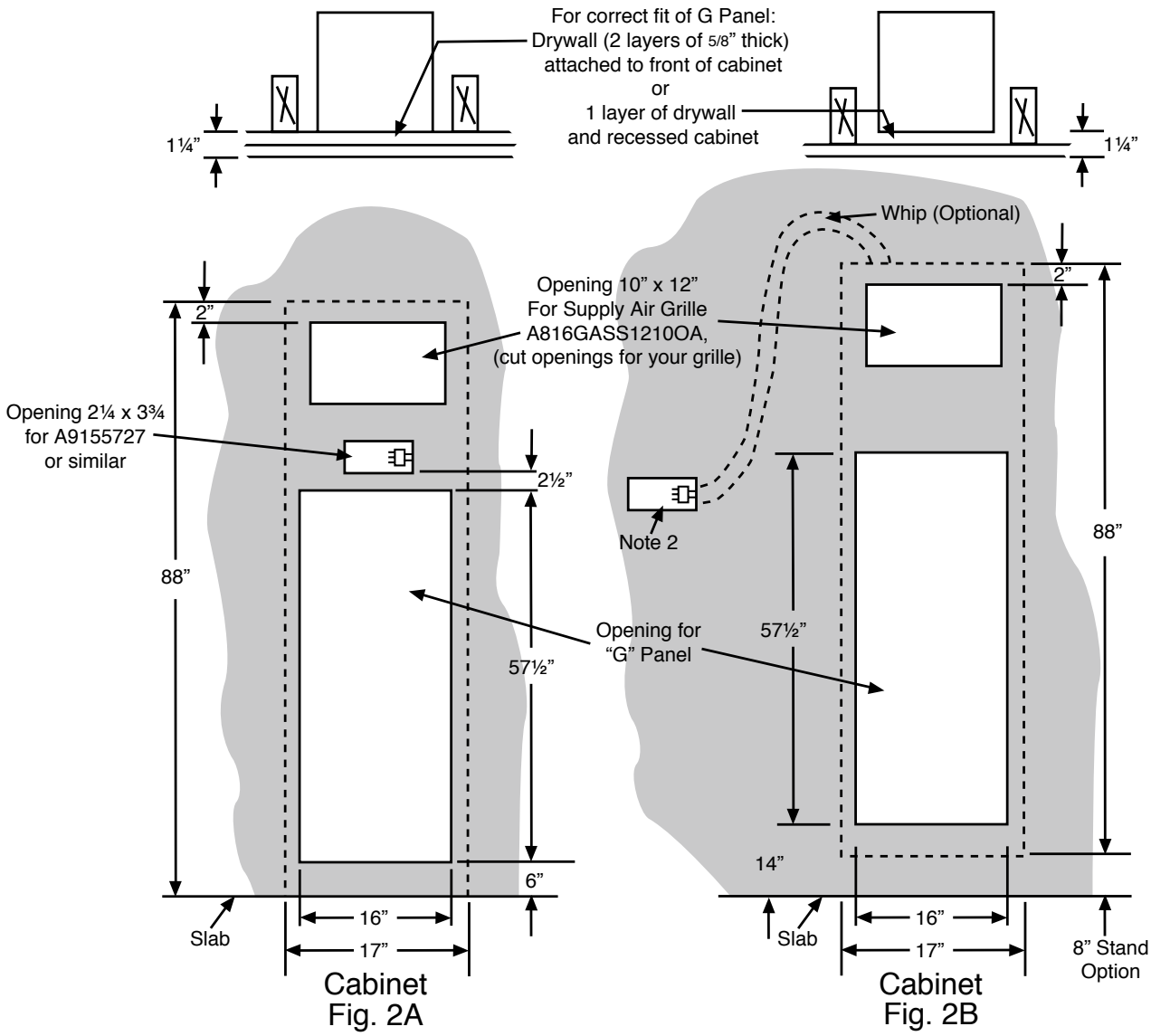
Table 1: Supply Grille Sizes and Arrangements

Unit Size	Single Discharge	Double Discharge	Triple Discharge
TRM09	12" x 10"	10" x 6"	N/A
TRM12	12" x 12"	10" x 6"	N/A
TRM15	16" x 12"	14" x 8"	14" x 6"
TRM18	16" x 12"	14" x 8"	14" x 6"
TRM24	N/A	16" x 10"	16" x 6"
TRM30	N/A	16" x 12"	12" x 10"
TRM36	N/A	16" x 14"	16" x 10"

Vertical Stack

Rev.: 11/09/12

NOTICE - Drywall openings shown below are for specific cabinets.
Cut openings for your cabinet.



Drywall Openings for 09SG0P0A1A00DOA on floor

Drywall Openings for 09SG0P0A1A00DOA With 8" Stand and Whip Option

Notes:

1. Whip ends with 9 pin molex connector.
2. Field-supplied 2x4 Box must be a type that the side can be removed so molex can be put inside.
3. Special 25, 35 and 45 foot whips and BX armor available.
4. Special 1" to 10" stands available.
5. When stands are used, make sure riser length and position is calculated correctly. 3" above and tailpiece always from cabinet. Stand raises everything up.

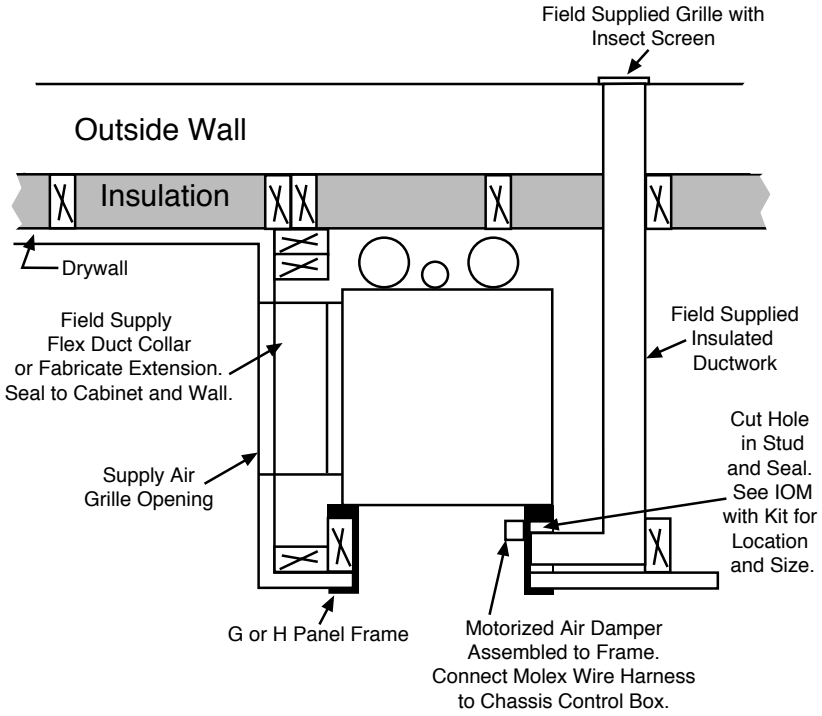
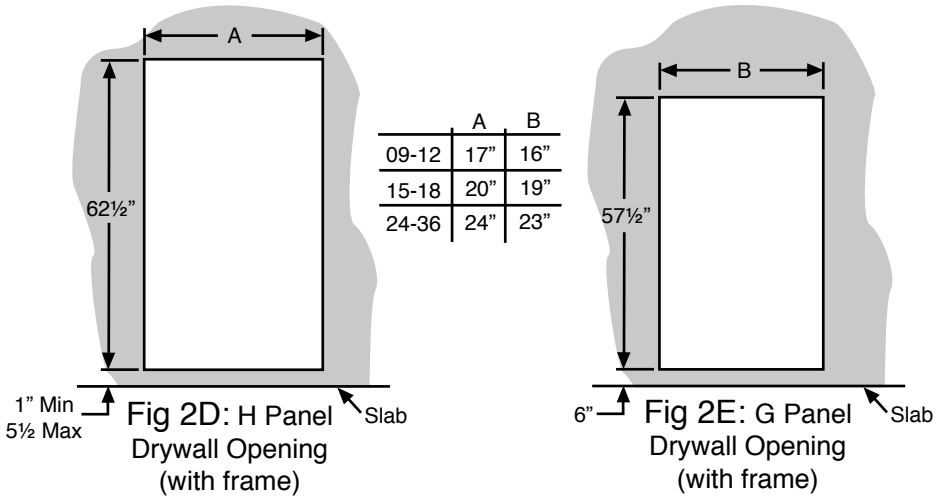


Fig 2C

TOP VIEW

Cabinet with Frame
and Optional Outside Air

Notes:
1. All units with outside air option must use motorized air damper. Damper to be closed when unit not operating.
2. Duct can be on right or left side.
3. On all installations, return air must be 50°F (10°C) to 95°F (35°C).
4. On all installations, the ambient temperature behind interior wall must be above freezing.
5. Prevent condensate on all installations of risers and loop piping insulate if required.



	A	B
09-12	17"	16"
15-18	20"	19"
24-36	24"	23"

Fig 2D: H Panel Drywall Opening (with frame)

Fig 2E: G Panel Drywall Opening (with frame)

Piping Installation

Installation of Supply and Return Piping
Follow these piping guidelines.

1. Install a drain valve at the base of each supply and return riser to facilitate system flushing.
2. Factory standard cabinets have shut-off valves and hoses have swivel-joint fittings to permit chassis removal for servicing.
3. Place strainers at the inlet of each system circulating pump.
4. Select the proper hose length to allow slack between connection points. Hoses may vary in length by +2% to -4% under pressure.
5. Refer to Table 2. Do not exceed the minimum bend radius for the hose selected. Exceeding the minimum bend radius may cause the hose to collapse, which reduces water flow rate. Install an angle adapter to avoid sharp bends in the hose when the radius falls below the required minimum.

Insulation is not required on loop water piping except where the piping runs through unheated areas, outside the building or when the loop water temperature is below the minimum expected dew point of the pipe ambient conditions. Insulation is required if loop water temperature drops below the dew point (insulation is required for ground loop applications in most climates).

Pipe joint compound is not necessary when Teflon® thread tape is pre-applied to hose assemblies or when flared-end connections are used. If pipe joint compound is preferred, use compound only in small amounts on the external pipe threads of the fitting adapters. Prevent sealant from reaching the flared surfaces of the joint.

Note: When anti-freeze is used in the loop, ensure that it is compatible with the Teflon tape or pipe joint compound that is applied.

Maximum allowable torque for brass fittings is 30 ft-lbs [41 N-m]. If a torque wrench is not available, tighten finger-tight plus one quarter turn. Tighten steel fittings as necessary.

Pressure-rated hose assemblies designed specifically for use with ClimateMaster units should be used. Supply and return hoses are fitted with swivel-joint fittings at one end to prevent kinking during installation.

Refer to Figure 3 for an illustration of a typical supply/return hose kit. Adapters secure hose assemblies to the unit and risers. Install hose assemblies properly and check regularly to avoid system failure and reduced service life.

⚠ WARNING! ⚠

WARNING! Polyolester Oil, commonly known as POE oil, is a synthetic oil used in many refrigeration systems including those with HFC-410A refrigerant. POE oil, if it ever comes in contact with PVC or CPVS piping, may cause failure of the PVC/CPVC. PVC/CPVC piping should never be used as supply or return water piping with water source heat pump products containing HFC-410A as system failures and property damage may result.

⚠ CAUTION! ⚠

CAUTION! Corrosive system water requires corrosion resistant fittings and hoses, and may require water treatment.

Table 2: Metal Hose Minimum Bend Radii

Hose Diameter	Minimum Bend Radii
1/2" [12.7mm]	2-1/2" [6.4cm]
3/4" [19.1mm]	4" [10.2cm]
1" [25.4mm]	5-1/2" [14cm]
1-1/4" [31.8mm]	6-3/4" [17.1cm]

⚠ CAUTION! ⚠

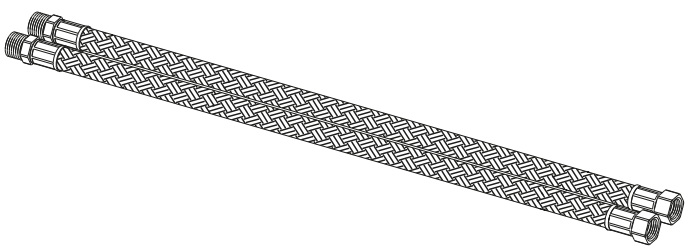
CAUTION! Do not bend or kink supply lines or hoses.

NOTICE! Do not allow hoses to rest against structural building components. Compressor vibration may be transmitted through the hoses to the structure, causing unnecessary noise complaints.

⚠ CAUTION! ⚠

CAUTION! Piping must comply with all applicable codes.

Figure 3: Supply/Return Hose Kit (AHH Series)



Water-Loop Heat Pump Applications

Commercial Water Loop Applications - Commercial systems typically include a number of units connected to a common piping system. Any unit plumbing maintenance work can introduce air into the piping system; therefore air elimination equipment is a major portion of the mechanical room plumbing. In piping systems expected to utilize water temperatures below 50°F [10°C], 1/2" (13mm) closed cell insulation is required on all piping surfaces to eliminate condensation (extended range units required). Metal to plastic threaded joints should never be used due to their tendency to leak over time.

Teflon tape thread sealant is recommended to minimize internal fouling of the heat exchanger. Do not over tighten connections and route piping so as not to interfere with service or maintenance access. Hose kits are available from ClimateMaster in different configurations for connection between the unit and the piping system. Depending upon selection, hose kits may include shut off valves, P/T plugs for performance measurement, high pressure stainless steel braided hose, "Y" type strainer with blow down valve, and/or "J" type swivel connection. Balancing valves and an external low pressure drop solenoid valve for use in variable speed pumping systems may also be included in the hose kit.

The piping system should be flushed to remove dirt, piping chips, and other foreign material prior to operation (see "Piping System Cleaning and Flushing Procedures" in this manual). The flow rate is usually set between 2.25 and 3.5 gpm per ton [2.9 and 4.5 l/m per kW] of cooling capacity. ClimateMaster recommends 3 gpm per ton [3.9 l/m per kW] for most applications of water loop heat pumps. To ensure proper maintenance and servicing, P/T ports are imperative for temperature and flow verification, as well as performance checks.

Water loop heat pump (cooling tower/boiler) systems typically utilize a common loop, maintained between 60 - 90°F [16 - 32°C]. The use of a closed circuit evaporative cooling tower with a secondary heat exchanger between the tower and the water loop is recommended. If an open type cooling tower is used continuously, chemical treatment and filtering will be necessary.

GROUND-LOOP HEAT PUMP APPLICATIONS

⚠ CAUTION! ⚠

CAUTION! The following instructions represent industry accepted installation practices for closed loop earth coupled heat pump systems. Instructions are provided to assist the contractor in installing trouble free ground loops. These instructions are recommendations only. State/provincial and local codes MUST be followed and installation MUST conform to ALL applicable codes. It is the responsibility of the installing contractor to determine and comply with ALL applicable codes and regulations.

⚠ CAUTION! ⚠

CAUTION! Ground loop applications require extended range equipment and optional refrigerant/water circuit insulation.

Pre-Installation - Prior to installation, locate and mark all existing underground utilities, piping, etc. Install loops for new construction before sidewalks, patios, driveways, and other construction has begun. During construction, accurately mark all ground loop piping on the plot plan as an aid in avoiding potential future damage to the installation.

Piping Installation - All earth loop piping materials should be limited to polyethylene fusion only for in-ground sections of the loop. Galvanized or steel fittings should not be used at any time due to their tendency to corrode. All plastic to metal threaded fittings should be avoided due to their potential to leak in earth coupled applications. A flanged fitting should be substituted. P/T plugs should be used so that flow can be measured using the pressure drop of the unit heat exchanger.

Earth loop temperatures can range between 25 and 110°F [-4 to 43°C]. Flow rates between 2.25 and 3 gpm per ton [2.41 to 3.23 l/m per kW] of cooling capacity is recommended in these applications.

Test individual horizontal loop circuits before backfilling. Test vertical U-bends and pond loop assemblies prior to installation. Pressures of at least 100 psi [689 kPa] should be used when testing. Do not exceed the pipe pressure rating. Test entire system when all loops are assembled.

Ground-Loop Heat Pump Applications

Flushing the Earth Loop - Upon completion of system installation and testing, flush the system to remove all foreign objects and purge to remove all air.

Antifreeze - In areas where minimum entering loop temperatures drop below 40°F [5°C] or where piping will be routed through areas subject to freezing, antifreeze is required. Alcohols and glycols are commonly used as antifreeze; however your local sales manager should be consulted for the antifreeze best suited to your area. Freeze protection should be maintained to 15°F [9°C] below the lowest expected entering loop temperature. For example, if 30°F [-1°C] is the minimum expected entering loop temperature, the leaving loop temperature would be 25 to 22°F [-4 to -6°C] and freeze protection should be at 15°F [-10°C]. Calculation is as follows: 30°F - 15°F = 15°F [-1°C - 9°C = -10°C].

All alcohols should be premixed and pumped from a reservoir outside of the building when possible or introduced under the water level to prevent fumes. Calculate the total volume of fluid in the piping system. Then use the percentage by volume shown in table 3 for the amount of antifreeze needed. Antifreeze concentration should be checked from a well mixed sample using a hydrometer to measure specific gravity.

Low Water Temperature Cutout Setting - CXM Control
When antifreeze is selected, the FP1 jumper (JW3) should be clipped to select the low temperature (antifreeze 10.0°F [-12.2°C]) setpoint and avoid nuisance faults (see "Low Water Temperature Cutout Selection" in this manual). **Note: Low water temperature operation requires extended range equipment.**

Table 3: Antifreeze Percentages by Volume

Type	Minimum Temperature for Low Temperature Protection			
	10°F [-12.2°C]	15°F [-9.4°C]	20°F [-6.7°C]	25°F [-3.9°C]
Methanol	25%	21%	16%	10%
100% USP food grade Propylene Glycol	38%	25%	22%	15%
Ethanol*	29%	25%	20%	14%

* Must not be denatured with any petroleum based product

Ground-Water Heat Pump Applications

Open Loop - Ground Water Systems - Shut off valves should be included for ease of servicing. Boiler drains or other valves should be "tee'd" into the lines to allow acid flushing of the heat exchanger. Shut off valves should be positioned to allow flow through the coax via the boiler drains without allowing flow into the piping system. P/T plugs should be used so that pressure drop and temperature can be measured. Supply and return water piping materials should be limited to copper, PE, or similar material. PVC or CPVC should never be used as they are incompatible with the POE oils used in HFC-410A products and piping system failure and property damage may result.

⚠ WARNING! ⚠

WARNING! Polyolester Oil, commonly known as POE oil, is a synthetic oil used in many refrigeration systems including those with HFC-410A refrigerant. POE oil, if it ever comes in contact with PVC or CPVS piping, may cause failure of the PVC/CPVC. PVC/CPVC piping should never be used as supply or return water piping with water source heat pump products containing HFC-410A as system failures and property damage may result.

Water quantity should be plentiful and of good quality. Consult Table 4 for water quality guidelines. The unit can be ordered with either a copper or cupro-nickel water heat exchanger. Consult Table 4 for recommendations. Copper is recommended for closed loop systems and open loop ground water systems that are not high in mineral content or corrosiveness. In conditions anticipating heavy scale formation or in brackish water, a cupro-nickel heat exchanger is recommended. In ground water situations where scaling could be heavy or where biological growth such as iron bacteria will be present, an open loop system is not recommended. Heat exchanger coils may over time lose heat exchange capabilities due to build up of mineral deposits. Heat exchangers must only be serviced by a qualified technician, as acid and special pumping equipment is required. Desuperheater coils can likewise become scaled and possibly plugged. In areas with extremely hard water, the owner should be informed that the heat exchanger may require occasional acid flushing. In some cases, the desuperheater option should not be recommended due to hard water conditions and additional maintenance required.

⚠ CAUTION! ⚠

CAUTION! Many units are installed with a factory or field supplied manual or electric shut-off valve. DAMAGE WILL OCCUR if shut-off valve is closed during unit operation. A high pressure switch must be installed on the heat pump side of any field provided shut-off valves and connected to the heat pump controls in series with the built-in refrigerant circuit high pressure switch to disable compressor operation if water pressure exceeds pressure switch setting. The field installed high pressure switch shall have a cut-out pressure of 300 psig and a cut-in pressure of 250 psig. This pressure switch can be ordered from ClimateMaster with a 1/4" internal flare connection as part number 39B0005N02.

Water Quality Standards - Table 4 should be consulted for water quality requirements. Scaling potential should be assessed using the pH/Calcium hardness method. If the pH <7.5 and the calcium hardness is less than 100 ppm, scaling potential is low. If this method yields numbers out of range of those listed, the Ryznar Stability and Langelier Saturation indecies should be calculated. Use the appropriate scaling surface temperature for the application, 150°F [66°C] for direct use (well water/open loop) and DHW (desuperheater); 90°F [32°F] for indirect use. A monitoring plan should be implemented in these probable scaling situations. Other water quality issues such as iron fouling, corrosion prevention and erosion and clogging should be referenced in Table 4.

Expansion Tank and Pump - Use a closed, bladder-type expansion tank to minimize mineral formation due to air exposure. The expansion tank should be sized to provide at least one minute continuous run time of the pump using its drawdown capacity rating to prevent pump short cycling. Discharge water from the unit is not contaminated in any manner and can be disposed of in various ways, depending on local building codes (e.g. recharge well, storm sewer, drain field, adjacent stream or pond, etc.). Most local codes forbid the use of sanitary sewer for disposal. Consult your local building and zoning department to assure compliance in your area.

Water Control Valve - Always maintain water pressure in the heat exchanger by placing the water control valve(s) on the discharge line to prevent mineral precipitation during the off-cycle. Pilot operated slow closing valves are recommended to reduce water hammer. If water hammer persists, a mini-expansion tank can be mounted on the piping to help absorb the excess hammer shock. Ensure that the total 'VA' draw of the valve can be supplied by the unit transformer. For instance, a slow closing valve can draw up to 35VA. This can overload smaller 40 or 50 VA transformers depending on the other controls in the circuit. A typical pilot operated solenoid valve draws approximately 15VA.

Flow Regulation - Flow regulation can be accomplished by two methods. One method of flow regulation involves simply adjusting the ball valve or water control valve on the discharge line. Measure the pressure drop through the unit heat exchanger, and determine flow rate from. Since the pressure is constantly varying, two pressure gauges may be needed. Adjust the valve until the desired flow of 1.5 to 2 gpm per ton [2.0 to 2.6 l/m per kW] is achieved. A second method of flow control requires a flow control device mounted on the outlet of the water control valve. The device is typically a brass fitting with an orifice of rubber or plastic material that is designed to allow a specified flow rate. On occasion, flow control devices may produce velocity noise that can be reduced by applying some back pressure from the ball valve located on the discharge line. Slightly closing the valve will spread the pressure drop over both devices, lessening the velocity noise. **Note: When EWT is below 50°F [10°C], 2 gpm per ton (2.6 l/m per kW) is required.**

Water Coil Low Temperature Limit Setting - For all open loop systems the 30°F [-1.1°C] FP1 setting (factory setting-water) should be used to avoid freeze damage to the unit. See "Low Water Temperature Cutout Selection" in this manual for details on the low limit setting.

NOTICE! Ground-water applications for commercial buildings with more than 2-3 units should include a plate frame heat-exchanger to isolate the heat pumps from the ground-water and confine heat exchanger cleanings to one location and lessen maintenance. Direct use of ground-water may increase the frequency of heat pump maintenance and may shorten life expectancy.

Water Quality Standards

Table 4: Water Quality Standards

Water Quality Parameter	HX Material	Closed Recirculating	Open Loop and Recirculating Well
Scaling Potential - Primary Measurement			
Above the given limits, scaling is likely to occur. Scaling indexes should be calculated using the limits below			
pH/Calcium Hardness Method	All	-	**pH < 7.5 and Ca Hardness <100ppm**
Index Limits for Probable Scaling Situations - (Operation outside these limits is not recommended)			
Scaling indexes should be calculated at 66°C for direct use and HWG applications, and at 32°C for indirect HX use. A monitoring plan should be implemented.			
Ryznar Stability Index	All	-	**6.0 - 7.5** If >7.5 minimize steel pipe use.
Langelier Saturation Index	All	-	**-0.5 to +0.5** If <-0.5 minimize steel pipe use. Based upon 66°C HWG and Direct well, 29°C Indirect Well HX
Iron Fouling			
Iron Fe $^{2+}$ (Ferrous) (Bacterial Iron potential)	All	-	**<0.2 ppm (Ferrous)** If Fe^{2+} (ferrous)>0.2 ppm with pH 6 - 8, O2<5 ppm check for iron bacteria.
Iron Fouling	All	-	**<0.5 ppm of Oxygen** Above this level deposition will occur.
Corrosion Prevention			
pH	All	**6 - 8.5** Monitor/treat as needed	**6 - 8.5** Minimize steel pipe below 7 and no open tanks with pH <8
Hydrogen Sulfide (H_2S)	All	-	**<0.5 ppm** At H_2S>0.2 ppm, avoid use of copper and copper nickel piping or HX's. Rotten egg smell appears at 0.5 ppm level. Copper alloy (bronze or brass) cast components are OK to <0.5 ppm.
Ammonia ion as hydroxide, chloride, nitrate and sulfate compounds	All	-	**<0.5 ppm**
Maximum Chloride Levels			Maximum Allowable at maximum water temperature.
			10°C / 24°C / 38°C
	Copper	-	<20ppm / NR / NR
	Cupronickel	-	<150 ppm / NR / NR
	304 SS	-	<400 ppm / <250 ppm / <150 ppm
	316 SS	-	<1000 ppm / <550 ppm / < 375 ppm
	Titanium	-	>1000 ppm / >550 ppm / >375 ppm
Erosion and Clogging			
Particulate Size and Erosion	All	<10 ppm of particles and a maximum velocity of 1.8 m/s Filtered for maximum 841 micron [0.84 mm, 20 mesh] size.	<10 ppm (<1 ppm "sandfree" for reinjection) of particles and a maximum velocity of 1.8 m/s. Filtered for maximum 841 micron 0.84 mm, 20 mesh] size. Any particulate that is not removed can potentially clog components.

The ClimateMaster Water Quality Table provides water quality requirements for ClimateMaster coaxial heat exchangers. When water properties are outside of those requirements, an external secondary heat exchanger must be used to isolate the heat pump heat exchanger from the unsuitable water. Failure to do so will void the warranty for the coaxial heat exchanger.

Notes:
- Closed Recirculating system is identified by a closed pressurized piping system.
- Recirculating open wells should observe the open recirculating design considerations.
- NR - Application not recommended.
- "-" No design Maximum.

Electrical Wiring - Line Voltage

⚠ WARNING! ⚠

WARNING! To avoid possible injury or death due to electrical shock, open the power supply disconnect switch and secure it in an open position during installation.

⚠ CAUTION! ⚠

CAUTION! Use only copper conductors for field installed electrical wiring. Unit terminals are not designed to accept other types of conductors.

Electrical - Line Voltage
All field installed wiring, including electrical ground, must comply with the National Electrical Code as well as all applicable local codes. Refer to the unit electrical data for fuse sizes. Consult wiring diagram for field connections that must be made by the installing (or electrical) contractor.All final electrical connections must be made with a length of flexible conduit to minimize vibration and sound transmission to the building.

⚠ WARNING! ⚠

WARNING! Disconnect electrical power source to prevent injury or death from electrical shock.

General Line Voltage Wiring - Be sure the available power is the same voltage and phase shown on the unit serial plate. Line and low voltage wiring must be done in accordance with local codes or the National Electric Code, whichever is applicable.

Power Connection - Line voltage connection is made by connecting the incoming line voltage wires to the "L" side of the contactor.

208 Volt Operation - All commercial 208-230 Volt units are factory wired for 208 Volt operation. If supply voltage is 230V, then the transformer must be rewired to the 230V tap as illustrated on the wiring diagram by switching the red (208V) and the orange (230V) wires at the contactor terminal.

Blower Speed Selection – Units with PSC Motor
PSC (Permanent Split Capacitor) blower fan speed can be changed by moving the blue wire on the fan motor terminal block to the desired speed as shown in Figure 4. Most ClimateMaster units are shipped on the medium speed tap. Consult submittal data or engineering design guide for specific unit airflow tables. Typical unit design delivers rated airflow at nominal static on medium speed and rated airflow at a higher static on high speed for applications where higher static is required. Low speed will deliver approximately 85% of rated airflow. An optional high static blower is available on some 816 models.

Blower Speed Selection – Units with ECM-X Motor
Fan speeds can be changed by moving wires on motor terminal block shown in Fig. 4A. Use information in Table 5 to set CFM for your static.

Special Note for AHRI Testing: To achieve rated airflow for AHRI testing purposes on all PSC products, it is necessary to change the fan speed to "HI" speed, for ECM-X motor products TRM15 and 24 wire to medium low (2), TRM18 and 30 wire to medium (3) and TRM36 wire to medium high (4). When the heat pump has experienced less than 100 operational hours and the coil has not had sufficient time to be "seasoned", it is necessary to clean the coil with a mild surfactant such as Calgon to remove the oils left by manufacturing processes and enable the condensate to properly "sheet" off of the coil.

Figure 4: PSC Motor Speed Selection

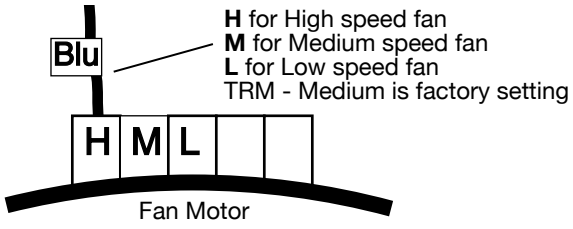
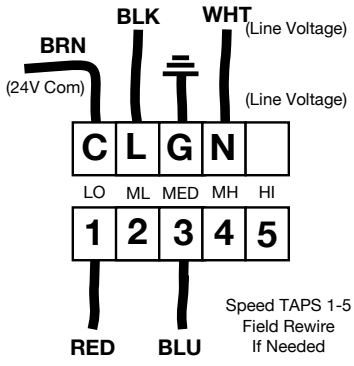


Figure 4A: ECM-X Motor Speed Selection



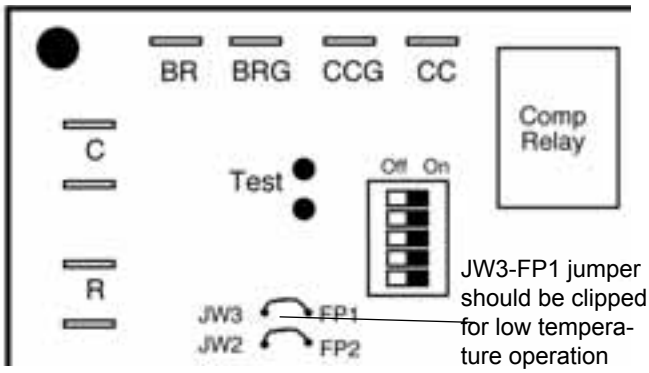
Electrical Wiring - Low Voltage

Thermostat Connections - The thermostat should be wired directly to the CXM or DXM board. See "Electrical – Thermostat" for specific terminal connections. Review the appropriate AOM (Application, Operation and Maintenance) manual for units with DDC controls.

Low Water Temperature Cutout Selection - The CXM/DXM control allows the field selection of low water (or water-antifreeze solution) temperature limit by clipping jumper JW3, which changes the sensing temperature associated with thermistor FP1. Note that the FP1 thermistor is located on the refrigerant line between the coaxial heat exchanger and expansion device (TXV or cap tube). Therefore, FP1 is sensing refrigerant temperature, not water temperature, which is a better indication of how water flow rate/temperature is affecting the refrigeration circuit.

The factory setting for FP1 is for systems using water (30°F [-1.1°C] refrigerant temperature). In low water temperature (extended range) applications with antifreeze (most ground loops), jumper JW3 should be clipped as shown in Figure 5 to change the setting to 10°F [-12.2°C] refrigerant temperature, a more suitable temperature when using an antifreeze solution. All ClimateMaster units operating with entering water temperatures below 59°F [15°C] must include the optional water/refrigerant circuit insulation package to prevent internal condensation.

Figure 5: FP1 Limit Setting



CXM PCB

JW3 should never be clipped for equipment or systems without antifreeze.

Blower Performance Data

Table 5: TRM with ECM-X Motor

Model	Motor TAP	Rated Airflow	Min CFM	Airflow (cfm) at External Static Pressure (in. wg)										
				0.0	0.1	0.2	0.25	0.3	0.35	0.4	0.5	0.6	0.7	0.8
TRM15	HI	600	416							650	590			
	MED HI							650	635	620	560			
	MED			650	640	630	615	600	595	590	520			
	MED LOW*			600	590	575	550	540	535	525	425			
	LOW			500	480	470	460	450	435	423				
TRM18	HI	650	480						675	650	590			
	MED HI						680	650	635	620	560			
	MED*			650	640	630	615	600	595	590	520			
	MED LOW			600	590	575	550	540	535	525				
	LOW			500	480									
TRM24	HI	900	596							925	875	840	800	750
	MED HI								920	900	840	800	750	700
	MED					925	900	880	850	815	750	700	620	
	MED LOW*			900	870	850	820	790	760	740	645			
	LOW			850	770	730	690	650	630	610				
TRM30	HI	1150	798		1200	1150	1100	1050	1030	995	950	925	875	840
	MED HI			1,200	1120	1050	1010	975	950	920	880	830	800	
	MED*			1,150	1070	1020	990	950	920	880	800			
	MED LOW			1,000	950	910	880	860	840	800				
	LOW			900	850	800								
TRM36	HI	1290	820			1310	1290	1260	1240	1170	1090	1025	920	840
	MED HI*			1290	1260	1230	1150	1120	1100	1070	1030	960	880	805
	MED			1190	1160	1140	1038	1010	990	950	910	860	820	
	MED LOW			860	840	825	800							
	LOW			820										

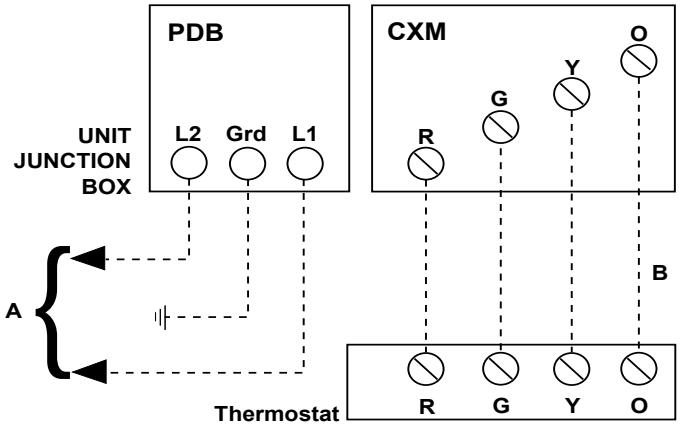
All units AHRI/ISO/ASHRAE 13256-1 rated on * speed motor TAP.
Airflow is rated at lowest Voltage if unit is dual Voltage rated, i.e. 208V for 208-230V units.
Unit must have DXM. Factory shipped on low and medium tap. Field select other taps if needed.

Thermostat Installation

Installation of Optional Wall-Mounted Thermostat - The unit can be furnished with a 24-volt surface mounted ACO or MCO control circuit or a remote 24-volt ACO or MCO thermostat. A typical field connection diagram is shown in Figure 6. Refer to instructions provided with remote thermostat for wiring instructions.

Low-voltage wiring between the unit and the wall thermostat must comply with all applicable electrical codes (i.e., NEC and local codes), and be completed before the unit is installed. Use of four-wire, color-coded, low-voltage cable is recommended.

Figure 6: Typical Field Connections for units with Wall-Mounted 24V Thermostat



⚠ WARNING! ⚠

WARNING! Disconnect electrical power source to prevent injury or death from electrical shock.

⚠ CAUTION! ⚠

CAUTION! Use copper conductors only to prevent **equipment** damage

Legend:
A = Two power wires and ground for single-phase units.
B = Low voltage (24 vac) up to 9 wires required. Check your thermostat.

Thermostat - 1H/1C, MCO or ACO
MCO = Manual changeover thermostat.
ACO = Automatic changeover thermostat.

Note: All customer-supplied wiring to be copper only, and must conform to NEC and local electrical codes. Wiring shown with dashed lines must be field-supplied and field-installed.

⚠ WARNING! ⚠

WARNING! Zone integrity must be maintained to efficiently control units or groups of units. Unless zones of control are considered and accounted for, adjacent units may operate in heating and cooling modes simultaneously.

Table 6 below lists recommended wire sizes and lengths to install the thermostat. The total resistance of low-voltage wiring must not exceed 1 ohm. Any resistance in excess of 1 ohm may cause the control to malfunction because of high voltage drop.

A9155 Series Thermostats have 6" pigtail ending with 9-pin Molex. This allows an easy connection to either surface mount or remote with whip option. AT Series Thermostats have to be wired to screw terminals under the cover.

TRM cabinets with optional electric heat require thermostat with minimum 2 stages of heat with emergency heat mode, similar to ATP32U03. Stage 1 is heat pump only. Stage 2 is heat pump with supplemental electric heat and emergency heat is electric heat only.

Table 6: Recommended Thermostat Wire Sizes

WIRE SIZE	MAX. WIRE LENGTH
22-Gauge	30 Feet
20-Gauge	50 Feet
18-Gauge	75 Feet
16-Gauge	125 Feet
14-Gauge	200 Feet

**Physical distance from thermostat to unit*

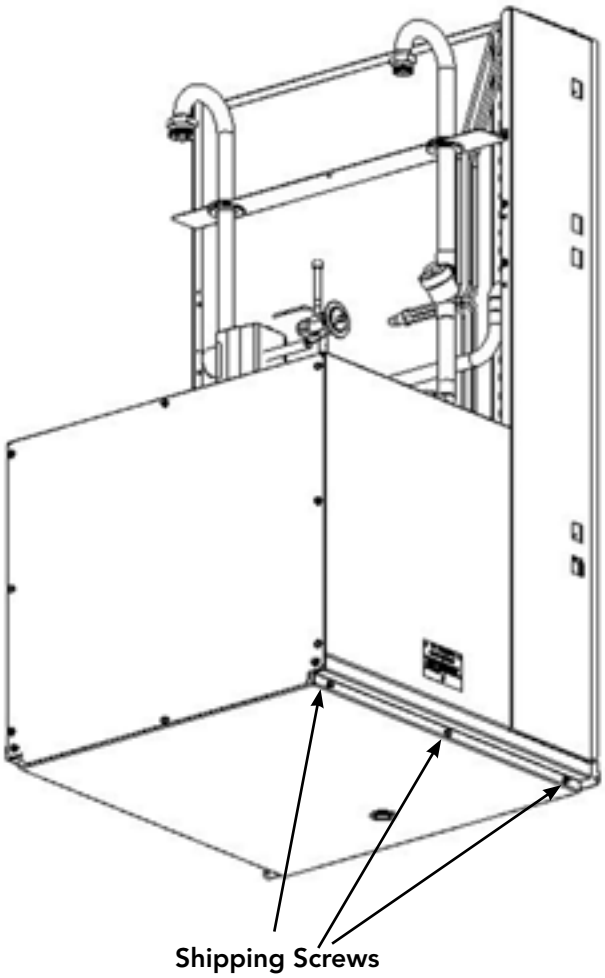
Chassis Pre-Installation

1. Check chassis data plate. Verify chassis is correct for cabinet.
2. Check for any shipping or handling damage. Make repairs or adjustments.
3. Verify refrigerant tubing is free of kinks or dents and that it does not touch other unit components.
4. Inspect all electrical connections. Connections must be clean and tight at the terminals.
5. Replace any panels or covers removed for steps 2-4.
6. Remove compressor shipping clips, brackets or screws per steps below. Always keep chassis upright.

The chassis is now ready for installation.

All TRM models (except TRM15 G Voltage) are ready for installation

Figure 13: TRM 15 G Voltage compressor shipping screw removal



Step 1: Remove the six screws from the very bottom of the sides, three from each side as shown above.

The chassis is now ready for installation.

Start-Up Preparation

System Cleaning and Flushing - Cleaning and flushing the unit is the single most important step to ensure proper start-up and continued efficient operation of the system. Follow the instructions below to properly clean and flush the system: Do not flush through chassis koax**.**

⚠ WARNING! ⚠

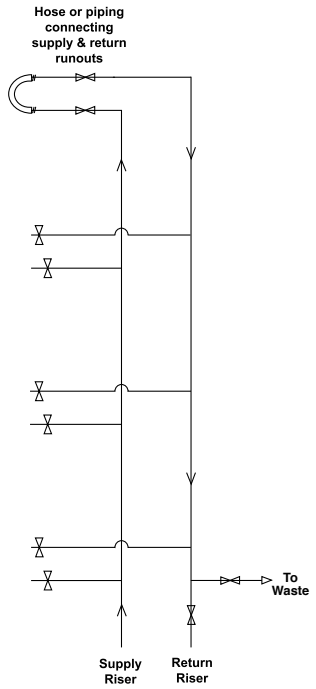
WARNING! To prevent injury or death due to electrical shock or contact with moving part, open unit disconnect before servicing unit.

1. Verify that electrical power to the unit is disconnected.
2. Verify that supply and return riser service valves are closed at each unit.
3. Fill the system with water, leaving the air vents open. Bleed all air from the system but do not allow the system to over flow. Check the system for leaks and make any required repairs.
4. Adjust the water and air level in the expansion tank.
5. With strainers in place, (ClimateMaster recommends a strainer with a #20 stainlees steel wire mesh) start the pumps. Systematically check each vent to ensure that all of the air is bled from the system.
6. Verify that make-up water is available and adjusted to properly replace any space remaining when all air is evacuated. Check the system for leaks and make any additional repairs required.
7. Set the boiler to raise the loop temperature to approximately 85°F [29.4°C]. Open the drain at the lowest point in the system. Verify that make-up water replacement rate equals rate of bleed. Continue to bleed the system until the water appears clean or for at least three hours whichever is longer.
8. Completely drain the system.

Flush risers as follows: (Refer to Figure 14).

1. Close shut-off valves at each cabinet on the riser except the shut-off valve on the top floor.
2. At the top floor, install the hose kit and connect the ends of the hoses with the factory riser flush adapter from AFL5751.
3. Flush solution through supply riser. Note: The solution passes through the top floor connection down the return riser.
4. When the building has more than 10 floors, connect the supply and return runouts on the top two floors to divide the water flow and reduce pressure drop at the pump.
5. Repeat flushing procedure for each set of risers in the building.
6. Refill the system and add in a proportion of trisodium phosphate approximately one pound per 150 gallons [0.4kg per 500 liters] of water. Reset the boiler to raise the loop temperature to about 100°F [37.8°C].
7. Circulate the solution for between 8 to 24 hours. At the end of this period, shut off the circulating pump and drain the solution. Repeat system cleaning if desired.
8. Open the supply and return riser service valves at each unit. Refill the system and bleed off all air.
9. Test the system pH with litmus paper. The system water should have a pH of 6 to 8.5. Add chemicals as appropriate to maintain pH levels.
10. When the system is successfully cleaned, flushed, refilled, and bled, check the main system panels, safety cutouts, and alarms. Set controls to properly maintain loop temperature.

Figure 14: Typical piping arrangement for flushing risers.



⚠ CAUTION! ⚠

CAUTION! Do Not use "Stop-Leak" or any similar chemical agent in this system. Addition of these chemicals to the loop water can foul the system and can inhibit unit operation.

⚠ CAUTION! ⚠

CAUTION! To avoid possible damage to piping systems constructed of plastic piping, DO NOT allow loop temperature to exceed 110°F [43.3°C].

Hose Kit & Chassis Installation

Hose Kit Installation - After cabinets are installed, remove the upper and lower panels. SAVE THESE FOR RE-INSTALLATION AFTER THE CHASSIS IS INSTALLED! The cabinet has one or two shipping braces across the front (Figure 15) remove and discard both braces.

Step 1: Remove (2) Panels and Shipping Braces

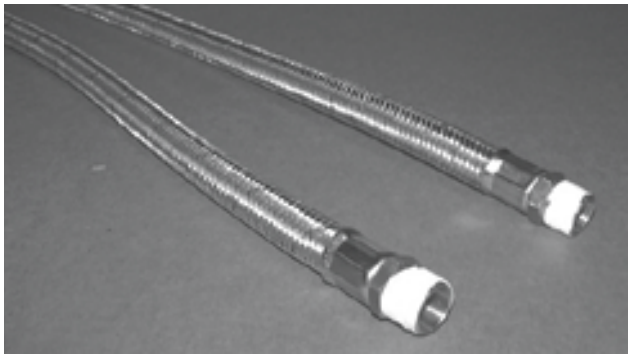
Figure 15

Step 2: Attach the Flex Hoses. Unpack and examine hose kit. Remove all shipping and/or packing material such as rubber bands, plastic caps, and styrofoam. Hose kit should contain (2) hoses (Figure 16).

⚠ CAUTION! ⚠

CAUTION! If the risers are under pressure, do not open shut off valves until installation is complete!

Figure 16



Locate the valves inside the unit cabinet marked WATER IN and WATER OUT (Figure 17). Apply Teflon tape to the male pipe thread end of each hose (Figure 16). Attach the hoses to the water valve. Always use a back-up wrench when tightening the hose to the valve (Figure 18).

⚠ WARNING! ⚠

WARNING! Under no circumstances should any part of the hose itself be gripped or twisted by hand, pliers, channel locks or any other tool. Leakage or bursting may occur! Always use a back-up wrench when tightening the hose.

Figure 17

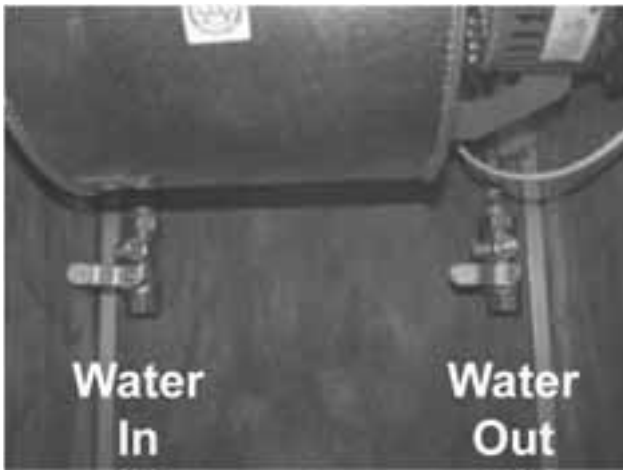


Figure 18

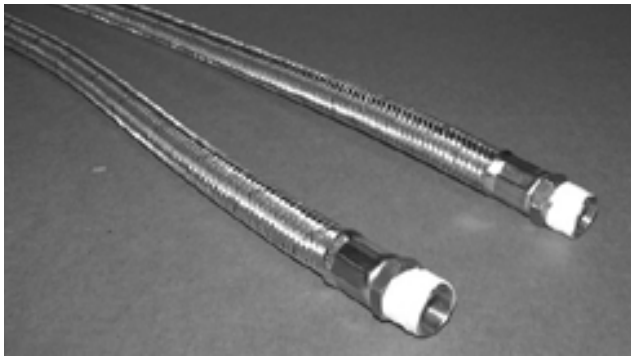
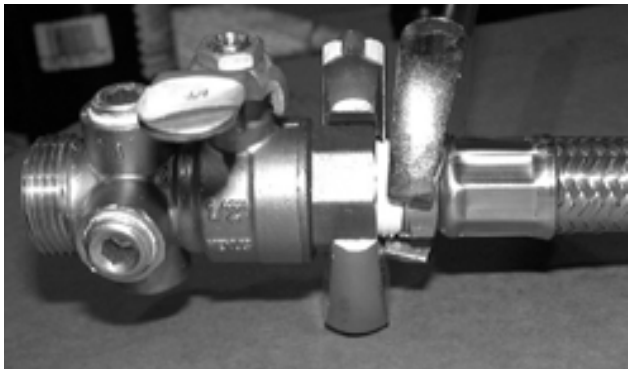


Figure 19

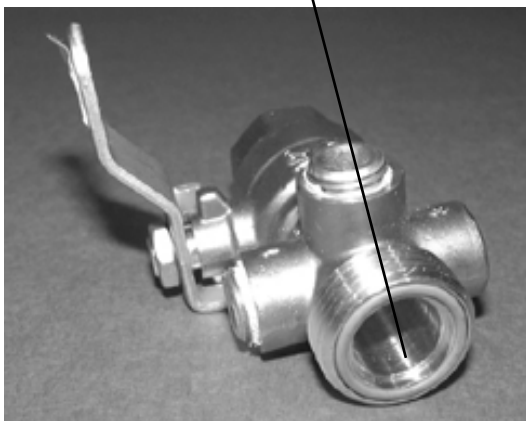


Option to Step 2

If you remove the valves to attach the hoses, be sure the 0-ring is in the valve before attaching to the union in the cabinet.

Note: The valve union is to be hand tight plus a 1/4 turn.

Figure 20



⚠ WARNING! ⚠

WARNING! Do Not Remove Valve without first draining the risers below cabinet level.

Step 2: Attach Flex Hoses. Let the universal ends of the hoses hang inside the cabinet for now. (Figure 22).

Note: Be sure the valve handles are in a position that enables them to be opened and closed. Check the swivel ends of the hoses (Figure 21). Gaskets must be in the hose for proper seal.

Figure 21

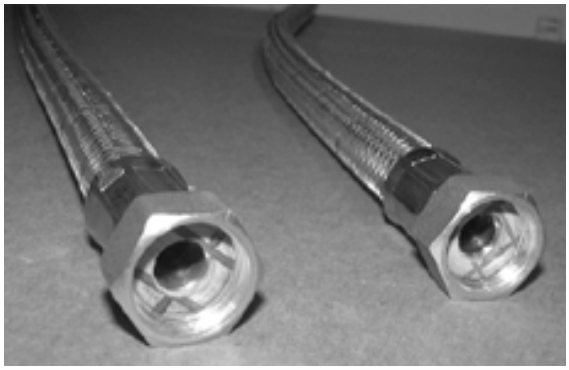
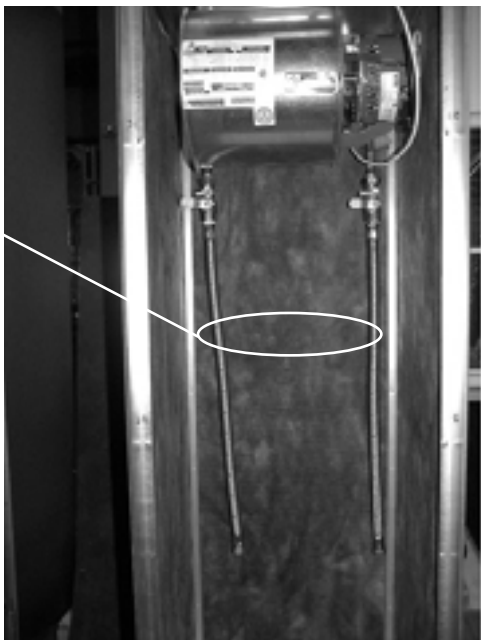


Figure 22



Step 3: Attach to the Chassis. Slide the chassis part way into the cabinet. Match the WATER IN hose to the WATER IN tube on the chassis and the WATER OUT hose to the WATER OUT tube. Tighten the swivel connection keeping the copper tube parallel to the sides of the chassis, then tighten the hose to the copper making sure the hose hangs straight without twisting or turning (Figure 23).

Note: The rule of thumb for tightening the copper union and the hose union is hand tight plus 1/4 turn.

⚠ WARNING! ⚠

WARNING! Under no circumstances should any part of the hose itself be gripped or twisted by hand, pliers, channel locks or any other tool. Leakage or bursting may occur! Always use a back-up wrench when tightening the hose.

Figure 23

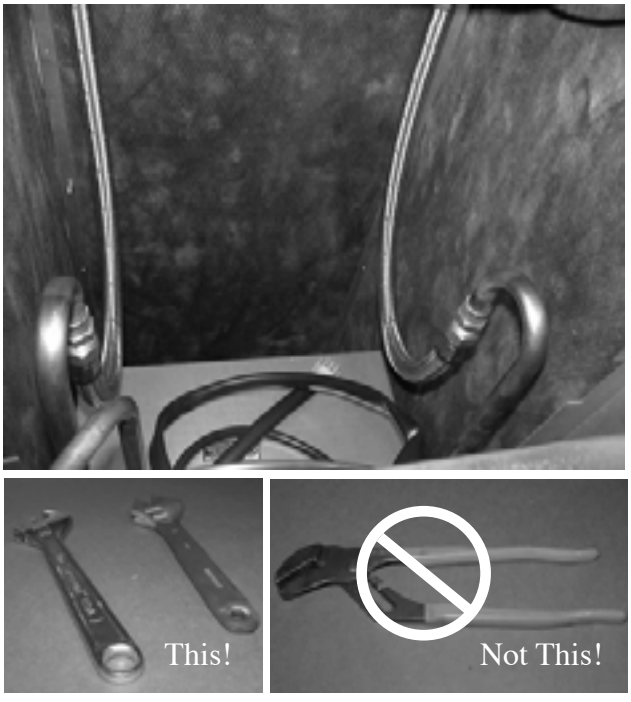
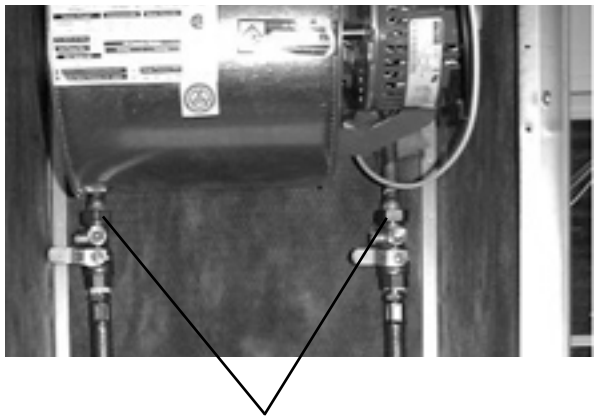


Figure 24



Check all connections for tightness including the ones above the installed valves (valve union). The chassis should slide into the cabinet without restriction (Figure 24).

Chassis and Hose Kit Installation

Install the Chassis as follows:

1. Verify that the shut-off/balancing valve in the return line and the shut-off valve in the supply line are closed.
2. Flush system following the procedure in Preparation for Start-up Section of this manual.
3. When the system is clean and flushed, open the unit water valves and check piping for leaks.
4. A flexible electrical cable terminating in quick-connect plugs is provided in chassis.
5. Complete electrical connections between cabinet and chassis by mating the quick-connect plugs on the chassis cable to the plugs located in the bottom surface of the blower deck, directly under the control box.
6. Install the air filter in the chassis by inserting the bottom edge of the filter into the bottom filter bracket. Push filter down until the top can be pushed into place, then latch the filter in place with the two top latches.

7. Before installing the return air/access panel, perform the following checks:
    a. Ensure that fan wheel rotates freely and does not rub against housing. If rough handling during shipping has caused fan wheel to shift, adjust as necessary.
    b. Verify that water piping connections to the chassis are complete and that unit service valves which were closed during flushing have been opened.
    c. Verify that power between the cabinet and chassis is properly connected.
    d. Assure that the unit drain is properly positioned, secured and not blocked.
    e. Verify that the nuts used to secure the blower assembly to the fan deck are tight. After the system has been filled and system pump is started, all connections should be re-checked for water leaks. ClimateMaster WILL NOT be responsible or liable for damage caused by water leaks at any field water connections!
8. Re-attach the upper and lower panels as shown in Figure 25.
9. Install the cabinet return air/access panel. See installation instructions shipped with return air/access panel for detailed information.

⚠ WARNING! ⚠

WARNING! Do Not Open Valves to chassis until system has been purged!

⚠ IMPORTANT! ⚠

IMPORTANT! After the system has been filled and system pump is started, all connections should be rechecked for water leaks. ClimateMaster WILL NOT be responsible or liable for damage caused by water leaks at any field water connections!

Figure 25

TRM Series Wiring Diagram Matrix

Only CXM and DXM diagrams for ACO/MCO Controls are presented in this IOM. Other diagrams can be located online at climatemaster.com. Click 'Commercial' (go to 'Quick Links' in the upper right) using the part numbers presented below.

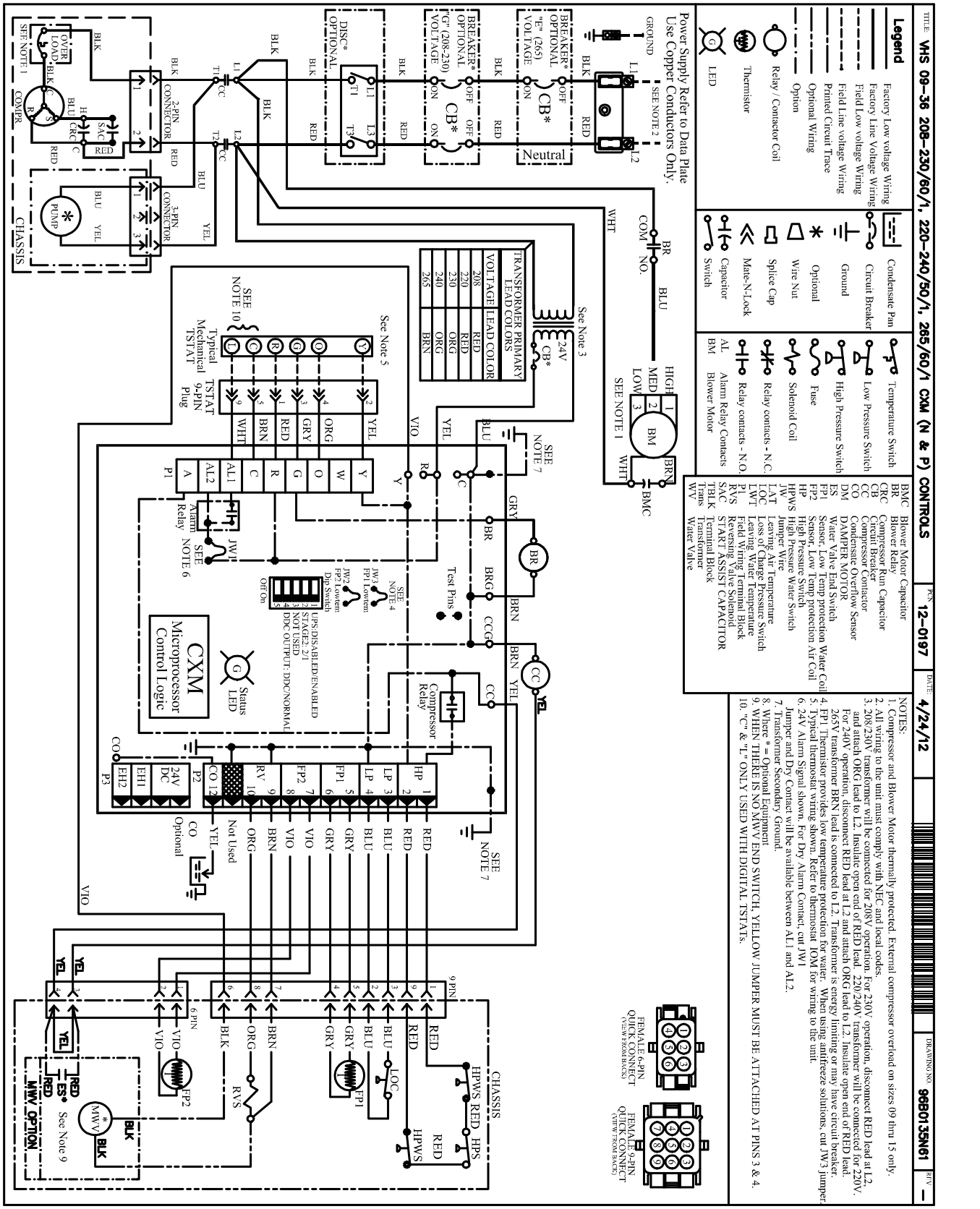
Cabinet

Model	Refrigerant	Wiring Diagram Part Number	Electrical	Control		Agency
TRM09-36 PSC Motor	EarthPure® (HFC-410A)	96B0135N61	208-230/60/1, 265/60/1	CXM	ACO/MCO	ETL
		96B0135N67			LON	
		96B0135N65			MPC	
		96B0135N62	208-230/60/1, 265/60/1	DXM	ACO/MCO	
		96B0135N68			LON	
		96B0135N66			MPC	
TRM09-12 ECM Motor		96B0173N27	208-230/60/1, 265/60/1		ACO/MCO	
		96B0173N25			LON	
		96B0173N26			MPC	
TRM15-36 ECM-X Motor		96B0135N92	208-230/60/1 265/60/1		ACO/MCO	
		96B0135N98			LON	
		96B0135N96			MPC	
TRM09-36 Electric Heater		96B0135N70	208-230/60/1 265/60/1		ACO/MCO	

Chassis

Model	Refrigerant	Wiring Diagram Part Number	Electrical	Control	Agency
TRM09-36	EarthPure® (HFC-410A)	96B0036N18	208-230/60/1, 265/60/1	CXM, DXM	ETL

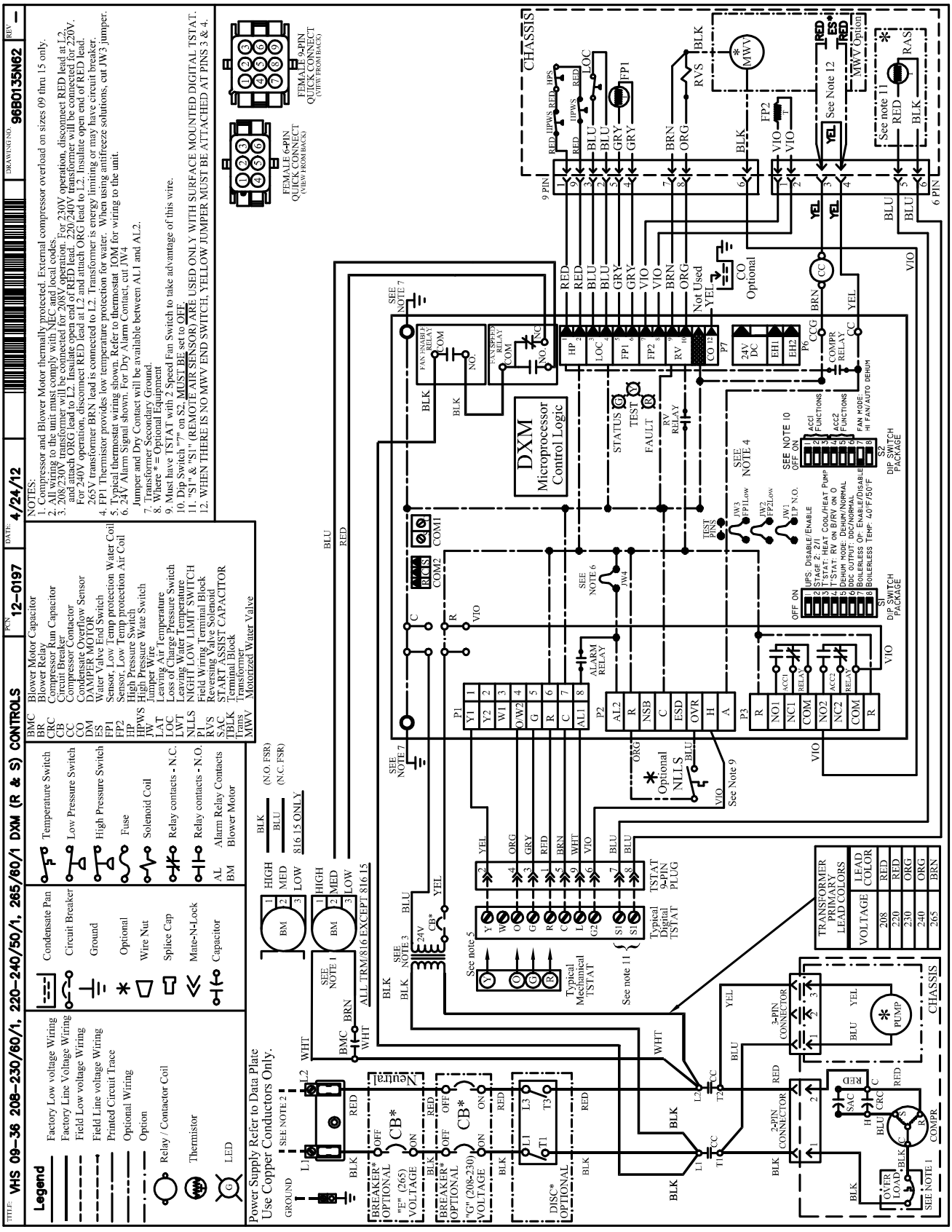
Typical Wiring Diagram
Single Phase TRM Units with CXM Controller



Vertical Stack

Rev.: 11/09/12

Typical Wiring Diagram
Single Phase TRM Units with DXM Controller


TITLE: VHS 09-36 208-230/60/1, 220-240/50/1, 265/60/1 DXM (R & S) CONTROLS
PCN 12-0197
DATE: 4/24/12
DRAWING NO. 96B0135N62
REV —
Legend
Factory Low voltage Wiring
Factory Line Voltage Wiring
Field Low voltage Wiring
Field Line voltage Wiring
Printed Circuit Trace
Optional Wiring
Option
Relay / Contactor Coil
Thermistor
LED
Condensate Pan
Circuit Breaker
Ground
Optional
Wire Nut
Splice Cap
Mate-N-Lock
Capacitor
Temperature Switch
Low Pressure Switch
High Pressure Switch
Fuse
Solenoid Coil
Relay contacts - N.C.
Relay contacts - N.O.
Alarm Relay Contacts
Blower Motor
BMC Blower Motor Capacitor
BR Blower Relay
CRC Compressor Run Capacitor
CB Circuit Breaker
CC Compressor Contactor
CO Condensate Overflow Sensor
DM DAMPER MOTOR
ES Water Valve End Switch
FP1 Sensor, Low Temp protection Water Coil
FP2 Sensor, Low Temp protection Air Coil
HP High Pressure Switch
HPWS High Pressure Wate Switch
JW Jumper Wire
LAT Leaving Air Temperature
LOC Loss of Charge Pressure Switch
LWT Leaving Water Temperature
NLLS NIGHT LOW LIMIT SWITCH
P1 Field Wiring Terminal Block
RVS Reversing Valve Solenoid
SAC START ASSIST CAPACITOR
TBLK Terminal Block
Trans. Transformer
MWV Motorized Water Valve
NOTES:
1. Compressor and Blower Motor thermally protected. External compressor overload on sizes 09 thru 15 only.
2. All wiring to the unit must comply with NEC and local codes.
3. 208/230V transformer will be connected for 208V operation. For 230V operation, disconnect RED lead at L2, and attach ORG lead to L2. Insulate open end of RED lead. 220/240V transformer will be connected for 220V. For 240V operation, disconnect RED lead at L2 and attach ORG lead to L2. Insulate open end of RED lead. 265V transformer BRN lead is connected to L2. Transformer is energy limiting or may have circuit breaker.
4. FP1 Thermistor provides low temperature protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Typical thermostat wiring shown. Refer to thermostat IOM for wiring to the unit.
6. 24V Alarm Signal shown. For Dry Alarm Contact, cut JW4.
Jumper and Dry Contact will be available between AL1 and AL2.
7. Transformer Secondary Ground.
8. Where * = Optional Equipment
9. Must have TSTAT with 2 Speed Fan Switch to take advantage of this wire.
10. Dip Switch "7" on S2, MUST BE set to OFF.
11. "S1" & "S1" (REMOTE AIR SENSOR) ARE USED ONLY WITH SURFACE MOUNTED DIGITAL TSTAT.
12. WHEN THERE IS NO MWV END SWITCH, YELLOW JUMPER MUST BE ATTACHED AT PINS 3 & 4.
FEMALE 6-PIN QUICK CONNECT (VIEW FROM BACK)
FEMALE 9-PIN QUICK CONNECT (VIEW FROM BACK)
CHASSIS
DXM Microprocessor Control Logic
Power Supply Refer to Data Plate
Use Copper Conductors Only.
GROUND
SEE NOTE 2
BREAKER* OPTIONAL "E" (265) VOLTAGE
BREAKER* OPTIONAL "G" (208-230) VOLTAGE
DISC* OPTIONAL
CB*
OVER LOAD
SEE NOTE 1
ALL TRM/S16 EXCEPT S16 15
SEE NOTE 3
24V
See note 5
Typical Mechanical TSTAT
See note 11
Typical Digital TSTAT
TSTAT 9-PIN PLUG
TRANSFORMER PRIMARY LEAD COLORS
VOLTAGE / LEAD COLOR
208 RED
220 RED
230 ORG
240 ORG
265 BRN
3-PIN CONNECTOR
2-PIN CONNECTOR
PUMP
COMPR
SEE NOTE 4
SEE NOTE 6
SEE NOTE 7
SEE NOTE 10
DIP SWITCH PACKAGE
TEST PINS
STATUS
TEST
FAULT
RV RELAY
ALARM RELAY
COMPR RELAY
FAN/POWER RELAY
LOW PRESS RELAY
Optional NLLS
See Note 9
Not Used
CO Optional
See Note 12
See note 11
MWV Option
RAS
(N.O. FSR)
(N.C. FSR)
HIGH
MED
LOW
BLK
BLU
RED
YEL
ORG
GRY
VIO
BRN
WHT

CXM Controls

CXM Control - For detailed control information, see CXM or DXM Application, Operation and Maintenance (AOM) manual (part # 97B0003N12 or part #97B0003N13).

Field Selectable Inputs - Test mode: Test mode allows the service technician to check the operation of the control in a timely manner. By momentarily shorting the test terminals, the CXM control enters a 20 minute test mode period in which all time delays are sped up 15 times. Upon entering test mode, the status LED will flash a code representing the last fault. For diagnostic ease at the thermostat, the alarm relay will also cycle during test mode. The alarm relay will cycle on and off similar to the status LED to indicate a code representing the last fault, at the thermostat. Test mode can be exited by shorting the test terminals for 3 seconds.
Retry Mode: If the control is attempting a retry of a fault, the status LED will slow flash (slow flash = one flash every 2 seconds) to indicate the control is in the process of retrying.

Field Configuration Options - Note: In the following field configuration options, jumper wires should be clipped ONLY when power is removed from the CXM control.

Water coil low temperature limit setting: Jumper 3 (JW3-FP1 Low Temp) provides field selection of temperature limit setting for FP1 of 30°F or 10°F [-1°F or -12°C] (refrigerant temperature).
Not Clipped = 30°F [-1°C]. Clipped = 10°F [-12°C].
Air coil low temperature limit setting: Jumper 2 (JW2-FP2 Low Temp) provides field selection of temperature limit setting for FP2 of 30°F or 10°F [-1°F or -12°C] (refrigerant temperature). **Note: This jumper should only be clipped under extenuating circumstances, as recommended by the factory.**
Not Clipped = 30°F [-1°C]. Clipped = 10°F [-12°C].
Alarm relay setting: Jumper 1 (JW1-AL2 Dry) provides field selection of the alarm relay terminal AL2 to be jumpered to 24VAC or to be a dry contact (no connection).
Not Clipped = AL2 connected to R. Clipped = AL2 dry contact (no connection).

DIP Switches - Note: In the following field configuration options, DIP switches should only be changed when power is removed from the CXM control.

DIP switch 1: Unit Performance Sentinel Disable **-** provides field selection to disable the UPS feature.
On = Enabled. Off = Disabled.

DIP switch 2: Stage 2 Selection - provides selection of whether compressor has an "on" delay. If set to stage 2, the compressor will have a 3 second delay before energizing. Also, if set for stage 2, the alarm relay will NOT cycle during test mode.
On = Stage 1. Off = Stage 2
DIP switch 3: Not Used.
DIP switch 4**:** DDC Output at EH2 - provides selection for DDC operation. If set to "DDC Output at EH2," the EH2 terminal will continuously output the last fault code of the controller. If set to "EH2 normal," EH2 will operate as standard electric heat output.
On = EH2 Normal. Off = DDC Output at EH2.
Note: Some CXM controls only have a 2 position DIP switch package. If this is the case, this option can be selected by clipping the jumper which is in position 4 of SW1.
Jumper not clipped = EH2 Normal. Jumper clipped = DDC Output at EH2.
DIP switch 5: Factory Setting - Normal position is "On." Do not change selection unless instructed to do so by the factory.

Table 7a: CXM/DXM LED And Alarm Relay Operations

Description of Operation	LED	Alarm Relay
Normal Mode	On	Open
Normal Mode with UPS Warning	On	Cycle (closed 5 sec., Open 25 sec.)
CXM is non-functional	Off	Open
Fault Retry	Slow Flash	Open
Lockout	Fast Flash	Closed
Over/Under Voltage Shutdown	Slow Flash	Open (Closed after 15 minutes)
Test Mode - No fault in memory	Flashing Code 1	Cycling Code 1
Test Mode - HP Fault in memory	Flashing Code 2	Cycling Code 2
Test Mode - LP Fault in memory	Flashing Code 3	Cycling Code 3
Test Mode - FP1 Fault in memory	Flashing Code 4	Cycling Code 4
Test Mode - FP2 Fault in memory	Flashing Code 5	Cycling Code 5
Test Mode - CO Fault in memory	Flashing Code 6	Cycling Code 6
Test Mode - Over/Under shutdown in memory	Flashing Code 7	Cycling Code 7
Test Mode - UPS in memory	Flashing Code 8	Cycling Code 8
Test Mode - Swapped Thermistor	Flashing Code 9	Cycling Code 9

-Slow Flash = 1 flash every 2 seconds
-Fast Flash = 2 flashes every 1 second
-Flash code 2 = 2 quick flashes, 10 second pause, 2 quick flashes, 10 second pause, etc.
-On pulse 1/3 second; off pulse 1/3 second

DXM Controls

DXM Control - For detailed control information, see CXM AOM (part #97B0003N12), DXM AOM (part #97B0003N13), Lon controller AOM (part #97B0013N01) or MPC AOM (part # 97B0031N01).

Table 7b: DXM LED And Alarm Relay Operations

Description of Operation	Status LED (green)	Test LED (yellow)	Fault LED (red)	Alarm Relay
Normal mode	On	-	Off	Open
Normal mode with UPS	On	-	Flashing Code 8	Cycle (closed 5 sec, open 25 sec)
DXM is non-functional	Off	Off	Off	Open
Fault Retry	Slow Flash	-	Flashing fault code	Open
Lockout	Fast Flash	-	Flashing fault code	Closed
Test Mode	-	On	-	-
Night Setback	Flashing Code 2	-	-	-
ESD	Flashing Code 3	-	-	-
Invalid T-stat Inputs	Flashing Code 4	-	-	-
HP Fault	Slow Flash	-	Flashing Code 2	Open
LP Fault	Slow Flash	-	Flashing Code 3	Open
FP1 Fault	Slow Flash	-	Flashing Code 4	Open
FP2 Fault	Slow Flash	-	Flashing Code 5	Open
CO Fault	Slow Flash	-	Flashing Code 6	Open
Over/Under Voltages	Slow Flash	-	Flashing Code 7	Open (closed after 15 minutes)

-Slow Flash = 1 flash every 2 seconds
-Fast Flash = 2 flashes every 1 second
-Flash code 2 = 2 quick flashes, 10 second pause, 2 quick flashes, 10 second pause, etc.
-On pulse 1/3 second; off pulse 1/3 second

Field Selectable Inputs - Test mode: Test mode allows the service technician to check the operation of the control in a timely manner. By momentarily shorting the test terminals, the DXM control enters a 20 minute test mode period in which all time delays are sped up 15 times. Upon entering test mode, the status LED will flash a code representing the last fault. For diagnostic ease at the thermostat, the alarm relay will also cycle during test mode. The alarm relay will cycle on and off similar to the status LED to indicate a code representing the last fault, at the thermostat. Test mode can be exited by shorting the test terminals for 3 seconds.
Retry mode: If the control is attempting a retry of a fault, the status LED will slow flash (slow flash = one flash every 2 seconds) to indicate the control is in the process of retrying.

Field Configuration Options
Note: In the following field configuration options, jumper wires should be clipped ONLY when power is removed from the DXM control.

Water coil low temperature limit setting: Jumper 3 (JW3-FP1 Low Temp) provides field selection of temperature limit setting for FP1 of 30°F or 10°F [-1°F or -12°C] (refrigerant temperature).
Not Clipped = 30°F [-1°C]. Clipped = 10°F [-12°C].
Air coil low temperature limit setting: Jumper 2 (JW2-FP2 Low Temp) provides field selection of temperature limit setting for FP2 of 30°F or 10°F [-1°F or -12°C] (refrigerant temperature). Note: This jumper should only be clipped under extenuating circumstances, as recommended by ClimateMaster technical services.
Not Clipped = 30°F [-1°C]. Clipped = 10°F [-12°C].
Alarm relay setting: Jumper 4 (JW4-AL2 Dry) provides field selection of the alarm relay terminal AL2 to be jumpered to 24VAC or to be a dry contact (no connection).
Not Clipped = AL2 connected to R.
Clipped = AL2 dry contact (no connection).
Low pressure normally open: Jumper 1 (JW1-LP norm open) provides field selection for low pressure input to be normally closed or normally open.
Not Clipped = LP normally closed. Clipped = LP normally open.

DIP Switches - Note: In the following field configuration options, DIP switches should only be changed when power is removed from the DXM control.

DIP Package #1 (S1) - DIP Package #1 has 8 switches and provides the following setup selections:
1.1 - Unit Performance Sentinel (UPS) disable: DIP Switch 1.1 provides field selection to disable the UPS feature. On = Enabled. Off = Disabled.
1.2 - Compressor relay staging operation: DIP 1.2 provides selection of compressor relay staging operation. The compressor relay can be selected to turn on with a stage 1 or stage 2 call from the thermostat. This is used with dual stage units (2 compressors where 2 DXM controls are being used) or with master/slave applications. In master/slave applications, each compressor and fan will stage according to its appropriate DIP 1.2 setting. If set to stage 2, the compressor will have a 3 second on-delay before energizing during a Stage 2 demand. Also, if set for stage 2, the alarm relay will NOT cycle during test mode. On = Stage 1. Off = Stage 2.

1.3 - Thermostat type (heat pump or heat/cool): DIP 1.3 provides selection of thermostat type. Heat pump or heat/cool thermostats can be selected. When in heat/cool mode, Y1 is the input call for cooling stage 1; Y2 is the input call for cooling stage 2; W1 is the input call for heating stage 1; and O/W2 is the input call for heating stage 2. In heat pump mode, Y1 is the input call for compressor stage 1; Y2 is the input call for compressor stage 2; W1 is the input call for heating stage 3 or emergency heat; and O/W2 is the input call for reversing valve (heating or cooling, depending upon DIP 1.4).
On = Heat Pump. Off = Heat/Cool.
1.4 - Thermostat type (O/B): DIP 1.4 provides selection of thermostat type for reversing valve activation. Heat pump thermostats with "O" output (reversing valve energized for cooling) or "B" output (reversing valve energized for heating) can be selected with DIP 1.4.
On = HP stat with "O" output for cooling. Off = HP stat with "B" output for heating.
1.5 - Dehumidification mode: DIP 1.5 provides selection of normal or dehumidification fan mode. In dehumidification mode, the fan speed relay will remain off during cooling stage 2. In normal mode, the fan speed relay will turn on during cooling stage 2.
On = Normal fan mode. Off = Dehumidification mode.
1.6 - DDC output at EH2: DIP 1.6 provides selection for DDC operation. If set to "DDC Output at EH2," the EH2 terminal will continuously output the last fault code of the controller. If set to "EH2 normal," EH2 will operate as standard electric heat output.
On = EH2 Normal. Off = DDC Output at EH2.
1.7 - Boilerless operation: DIP 1.7 provides selection of boilerless operation. In boilerless mode, the compressor is only used for heating when FP1 is above the temperature specified by the setting of DIP 1.8. Below DIP 1.8 setting, the compressor is not used and the control goes into emergency heat mode, staging on EH1 and EH2 to provide heating.
On = normal. Off = Boilerless operation.
1.8 - Boilerless changeover temperature: DIP 1.8 provides selection of boilerless changeover temperature set point. Note that the FP1 thermistor is sensing refrigerant temperature between the coaxial heat exchanger and the expansion device (TXV or cap tube). Therefore, the 50°F [10°C] setting is not 50°F [10°C] water, but approximately 60°F [16°C] EWT.
On = 50°F [10°C]. Off = 40°F [16°C].

DIP Package #2 (S2) - DIP Package #2 has 8 switches and provides the following setup selections:
2.1 - Accessory1 relay personality: DIP 2.1 provides selection of ACC1 relay personality (relay operation/characteristics). See table 6c for description of functionality.
2.2 - Accessory1 relay personality: DIP 2.2 provides selection of ACC 1 relay personality (relay operation/characteristics). See table 6c for description of functionality.
2.3 - Accessory1 relay personality: DIP 2.3 provides selection of ACC 1 relay options. See table 6c for description of functionality.
2.4 - Accessory2 relay personality: DIP 2.4 provides selection of ACC 2 relay personality (relay operation/characteristics). See table 6c for description of functionality.
2.5 - Accessory2 relay personality: DIP 2.5 provides selection of ACC 2 relay personality (relay operation/characteristics). See table 6c for description of functionality.
2.6 - Accessory2 relay personality: DIP 2.6 provides selection of ACC 2 relay options. See table 6c for description of functionality.
2.7 - Auto dehumidification fan mode or high fan mode: DIP 2.7 provides selection of auto dehumidification fan mode or high fan mode. In auto dehumidification mode, the fan speed relay will remain off during cooling stage 2 IF the H input is active. In high fan mode, the fan enable and fan speed relays will turn on when the H input is active.
On = Auto dehumidification mode. Off = High fan mode.
2.8 - Special factory selection: DIP 2.8 provides special factory selection. Normal position is "On." Do not change selection unless instructed to do so by the factory.

Table 7c: Accessory DIP Switch Settings

DIP 2.1	DIP 2.2	DIP 2.3	ACC1 Relay Option
On	On	On	Cycle with fan
Off	On	On	Digital NSB
On	Off	On	Water Valve - slow opening
On	On	Off	OAD
Off	Off	Off	Reheat Option - Humidistat
Off	On	Off	Reheat Option - Dehumidistat
DIP 2.4	**DIP 2.5**	**DIP 2.6**	**ACC2 Relay Option**
On	On	On	Cycle with compressor
Off	On	On	Digital NSB
On	Off	On	Water Valve - slow opening
On	On	Off	OAD

All other DIP combinations are invalid

Safety Features - CXM/DXM Controls

Safety Features – CXM/DXM Control
The safety features below are provided to protect the compressor, heat exchangers, wiring and other components from damage caused by operation outside of design conditions.
Anti-short cycle protection: The control features a 5 minute anti-short cycle protection for the compressor. Note: The 5 minute anti-short cycle also occurs at power up.
Random start: The control features a random start upon power up of 5-80 seconds.
Fault Retry: In Fault Retry mode, the Status LED begins slowly flashing to signal that the control is trying to recover from a fault input. The control will stage off the outputs and then "try again" to satisfy the thermostat input call. Once the thermostat input call is satisfied, the control will continue on as if no fault occurred. If 3 consecutive faults occur without satisfying the thermostat input call, the control will go into "lockout" mode. The last fault causing the lockout will be stored in memory and can be viewed at the "fault" LED (DXM board) or by going into test mode (CXM board). Note: FP1/FP2 faults are factory set at only one try.
Lockout: In lockout mode, the status LED will begin fast flashing. The compressor relay is turned off immediately. Lockout mode can be "soft" reset by turning off the thermostat (or satisfying the call). A "soft" reset keeps the fault in memory but resets the control. A "hard" reset (disconnecting power to the control) resets the control and erases fault memory.
Lockout with emergency heat: While in lockout mode, if W becomes active (CXM), emergency heat mode will occur. If DXM is configured for heat pump thermostat type (DIP 1.3), emergency heat will become active if O/W2 is energized.
High pressure switch: When the high pressure switch opens due to high refrigerant pressures, the compressor relay is de-energized immediately since the high pressure switch is in series with the compressor contactor coil. The high pressure fault recognition is immediate (does not delay for 30 continuous seconds before de-energizing the compressor).
High pressure lockout code = 2
Example: 2 quick flashes, 10 sec pause, 2 quick flashes, 10 sec. pause, etc.
Low pressure switch: The low pressure switch must be open and remain open for 30 continuous seconds during "on" cycle to be recognized as a low pressure fault. If the low pressure switch is open for 30 seconds prior to compressor power up it will be considered a low pressure (loss of charge) fault. The low pressure switch input is bypassed for the initial 120 seconds of a compressor run cycle.
Low pressure lockout code = 3
Water coil low temperature (FP1): The FP1 thermistor temperature must be below the selected low temperature limit setting for 30 continuous seconds during a compressor run cycle to be recognized as a FP1 fault. The FP1 input is bypassed for the initial 120 seconds of a compressor run cycle. FP1 is set at the factory for one try. Therefore, the control will go into lockout mode once the FP1 fault has occurred.
FP1 lockout code = 4
Air coil low temperature (FP2): The FP2 thermistor temperature must be below the selected low temperature limit setting for 30 continuous seconds during a compressor run cycle to be recognized as a FP2 fault. The FP2 input is bypassed for the initial 60 seconds of a compressor run cycle. FP2 is set at the factory for one try. Therefore, the control will go into lockout mode once the FP2 fault has occurred.
FP2 lockout code = 5
Condensate overflow: The condensate overflow sensor must sense overflow level for 30 continuous seconds to be recognized as a CO fault. Condensate overflow will be monitored at all times.
CO lockout code = 6
Over/under voltage shutdown: An over/under voltage condition exists when the control voltage is outside the range of 19VAC to 30VAC. Over/under voltage shut down is a self-resetting safety. If the voltage comes back within range for at least 0.5 seconds, normal operation is restored. This is not considered a fault or lockout. If the CXM/DXM is in over/under voltage shutdown for 15 minutes, the alarm relay will close.
Over/under voltage shut down code = 7
Unit Performance Sentinel-UPS (patent pending): The UPS feature indicates when the heat pump is operating inefficiently. A UPS condition exists when:

a. In heating mode with compressor energized, FP2 is greater than 125°F [52°C] for 30 continuous seconds, or:
b. In cooling mode with compressor energized, FP1 is greater than 125°F [52°C] for 30 continuous seconds, or:
c. In cooling mode with compressor energized, FP2 is less than 40°F [4.5°C] for 30 continuous seconds.

If a UPS condition occurs, the control will immediately go to UPS warning. The status LED will remain on as if the control is in normal mode. Outputs of the control, excluding LED and alarm relay, will NOT be affected by UPS. The UPS condition cannot occur during a compressor off cycle. During UPS warning, the alarm relay will cycle on and off. The cycle rate will be "on" for 5 seconds, "off" for 25 seconds, "on" for 5 seconds, "off" for 25 seconds, etc.

UPS warning code = 8
Swapped FP1/FP2 thermistors: During test mode, the control monitors to see if the FP1 and FP2 thermistors are in the appropriate places. If the control is in test mode, the control will lockout with code 9 after 30 seconds if:

a. The compressor is on in the cooling mode and the FP1 sensor is colder than the FP2 sensor, or:
b. The compressor is on in the heating mode and the FP2 sensor is colder than the FP1 sensor.

Swapped FP1/FP2 thermistor code = 9.
ESD (DXM only): The ESD (Emergency Shut Down) mode can be enabled from an external common signal to terminal ESD to shut down the unit. The green status light will flash code 3 when the unit is in ESD mode.
ESD mode = code 3 (green "status" LED)

Diagnostic Features - The LED on the CXM board advises the technician of the current status of the CXM control. The LED can display either the current CXM mode or the last fault in memory if in test mode. If there is no fault in memory, the LED will flash Code 1 (when in test mode).

⚠ CAUTION! ⚠

CAUTION! Do not restart units without inspection and remedy of faulting condition. Equipment damage may occur.

The green status LED and red fault LED on the DXM board advise the technician of the current status of the DXM control. The status LED will indicate the current mode that the DXM control is in. The fault LED will ALWAYS flash a code representing the LAST fault in memory. If there is no fault in memory, the fault LED will flash Code 1. The yellow test LED will turn on when in test mode.

CXM/DXM Control Start-up Operation - The control will not operate until all inputs and safety controls are checked for normal conditions. The compressor will have a 5 minute anti-short cycle delay at power-up. The first time after power-up that there is a call for compressor, the compressor will follow a 5 to 80 second random start delay. After the random start delay and anti-short cycle delay, the compressor relay will be energized. On all subsequent compressor calls, the random start delay is omitted.

UNIT COMMISSIONING AND OPERATING CONDITIONS

Environment - This unit is designed for indoor installation only. Do not install in an area subject to freezing or where humidity levels can cause cabinet condensation.

Power Supply - A voltage variation of +/- 10% of nameplate utilization voltage is acceptable.

Operation and performance is primarily dependent upon return air temperature, airflow, water temperature, water flow rate and ambient air temperature. This water to air heat pump is capable of operating over a wide temperature range and with flow rates of between 1.5 GPM (.1 l/s) and 3 GPM (.19 l/s) per ton, however usually no more than one of these factors may be at a minimum or maximum level at a time.

The commissioning table indicates air and water temperatures which are suitable for initial unit commissioning in an environment where the flow rate and water temperature is not yet stable and to avoid nuisance shut down of the units freeze and refrigerant pressure safeties.

The operating table indicates the maximum and minimum ranges of the unit.

For more specific unit performance reference the product catalog, the submittal data sheets or contact your supplier for assistance.

Table 8: Building Commissioning Limits

BUILDING COMMISSIONING		
	ALL TRM MODELS	
	Cooling °F [°C]	Heating °F [°C]
AMBIENT MIN - MAX DB	45-110 [7-43]	40-85 [4.5-29]
RETURN AIR MIN DB/WB	60/45 [16/7]	40 [4.5]
RETURN AIR MAX DB/WB	100-83 [38-28]	80 [27]
STANDARD UNIT ENTERING WATER MIN* - MAX	40-120 [4.5-49]	60-90 [16-43]
EXTENDED RANGE UNIT** ENTERING WATER MIN* - MAX	30-120 [-1-49]	20-90 [-6.7-32]

*- Requires optional insulation package when operating below the dew point
**- Requires antifreeze, optional insulation package and jumper clipped.

Table 8A: Unit Operating Limits

UNIT OPERATING LIMITS		
	ALL TRM MODELS	
	Cooling °F [°C]	Heating °F [°C]
AMBIENT MIN - MAX DB	50-100 [10-38]	50-85 [10-29]
RETURN AIR MIN DB/WB	65/60 [18/15.5]	50 [10]
RETURN AIR MAX DB/WB	95/75 [35/24]	80 [27]
STANDARD UNIT ENTERING WATER MIN* - MAX	50-120 [10-49]	60-90 [16-43]
EXTENDED RANGE UNIT** ENTERING WATER MIN* - MAX	30-120 [-1-49]	20-90 [-6.7-32]

*- Requires optional insulation package when operating below the dew point
**- Requires antifreeze, optional insulation package and jumper clipped.

Table 9: Water Temperature Change Through Heat Exchanger

Water Flow, gpm (l/m)	Rise, Cooling °F (°C)	Drop, Heating °F (°C)
For Closed Loop: Ground Source or Closed Loop Systems at 3 gpm per ton (3.9 l/m per kw)	9 - 12 (5 - 6.7)	4 - 8 (2.2 - 4.4)
For Open Loop: Ground Water Systems at 1.5 gpm per ton (2.0 l/m per kw)	20 - 26 (11.1 - 14.4)	10 - 17 (5.6 - 9.4)

PIPING SYSTEM CLEANING AND FLUSHING

Piping System Cleaning and Flushing - Cleaning and flushing the WLHP piping system is the single most important step to ensure proper start-up and continued efficient operation of the system. Do not flush through chassis koax.

Follow the instructions under 'System Cleaning and Flushing' to properly clean and flush the system.

Unit and System Checkout

⚠ WARNING! ⚠

WARNING! Polyolester Oil, commonly known as POE oil, is a synthetic oil used in many refrigeration systems including those with HFC-410A refrigerant. POE oil, if it ever comes in contact with PVC or CPVS piping, may cause failure of the PVC/CPVC. PVC/CPVC piping should never be used as supply or return water piping with water source heat pump products containing HFC-410A as system failures and property damage may result.

Note: The manufacturer strongly recommends all piping connections, both internal and external to the unit, be pressure tested by an appropriate method prior to any finishing of the interior space or before access to all connections is limited. Test pressure may not exceed the maximum allowable pressure for the unit and all components within the water system. The manufacturer will not be responsible or liable for damages from water leaks due to inadequate or lack of a pressurized leak test, or damages caused by exceeding the maximum pressure rating during installation.

BEFORE POWERING SYSTEM, please check the following:

UNIT CHECKOUT

- ❑ Balancing/shutoff valves: Ensure that all isolation valves are open and water control valves are wired. Line voltage and wiring: Verify that voltage is within an acceptable range for the unit and wiring and fuses/breakers are properly sized. Verify that low voltage wiring is complete.
- ❑ Unit control transformer: Ensure that transformer has the properly selected voltage tap. Commercial 208-230V units are factory wired for 208V operation unless specified otherwise.
- ❑ Entering water and air: Ensure that entering water and air temperatures are within operating limits of Table 8.
- ❑ Low water temperature cutout: Verify that low water temperature cut-out on the CXM/DXM control is properly set.
- ❑ Unit fan: Manually rotate fan to verify free rotation and ensure that blower wheel is secured to the motor shaft. Be sure to remove any shipping supports if needed. DO NOT oil motors upon start-up. Fan motors are pre-oiled at the factory. Check unit fan speed selection and compare to design requirements.
- ❑ Condensate line: Verify that condensate line is open and properly pitched toward drain.
- ❑ Water flow balancing: Record inlet and outlet water temperatures for each heat pump upon startup. This check can eliminate nuisance trip outs and high velocity water flow that could erode heat exchangers.
- ❑ Unit air coil and filters: Ensure that filter is clean and accessible. Clean air coil of all manufacturing oils.
- ❑ Unit controls: Verify that CXM or DXM field selection options are properly set.

SYSTEM CHECKOUT

- ❑ System water temperature: Check water temperature for proper range and also verify heating and cooling set points for proper operation.
- ❑ System pH: Check and adjust water pH if necessary to maintain a level between 6 and 8.5. Proper pH promotes longevity of hoses and fittings (see Table 4).
- ❑ System flushing: Verify that all hoses are connected end to end when flushing to ensure that debris bypasses the unit heat exchanger, water valves and other components. Water used in the system must be potable quality initially and clean of dirt, piping slag, and strong chemical cleaning agents. Verify that all air is purged from the system. Air in the system can cause poor operation or system corrosion.
- ❑ Cooling tower/boiler: Check equipment for proper set points and operation.
- ❑ Standby pumps: Verify that the standby pump is properly installed and in operating condition.
- ❑ System controls: Verify that system controls function and operate in the proper sequence.
- ❑ Low water temperature cutout: Verify that low water temperature cut-out controls are provided for the outdoor portion of the loop. Otherwise, operating problems may occur.
- ❑ System control center: Verify that the control center and alarm panel have appropriate set points and are operating as designed.
- ❑ Miscellaneous: Note any questionable aspects of the installation.

⚠ CAUTION! ⚠

CAUTION! Verify that ALL water control valves are open and allow water flow prior to engaging the compressor. Freezing of the coax or water lines can permanently damage the heat pump.

⚠ CAUTION! ⚠

CAUTION! To avoid equipment damage, DO NOT leave system filled in a building without heat during the winter unless antifreeze is added to the water loop. Heat exchangers never fully drain by themselves and will freeze unless winterized with antifreeze.

NOTICE! Failure to remove shipping brackets from spring-mounted compressors will cause excessive noise, and could cause component failure due to added vibration.

Unit Start-Up Procedures

Unit Start-up Procedure

1. Turn the thermostat fan position to "ON". Blower should start.
2. Balance air flow at registers.
3. Adjust all valves to their full open positions. Turn on the line power to all heat pumps.
4. Room temperature should be within the minimum-maximum ranges of Table 8. During start-up checks, loop water temperature entering the heat pump should be between 60°F [16°C] and 95°F [35°C].
5. Two factors determine the operating limits of ClimateMaster heat pumps, (a) return air temperature, and (b) water temperature. When any one of these factors is at a minimum or maximum level, the other factor must be at normal level to ensure proper unit operation.
    a. Adjust the unit thermostat to the warmest setting. Place the thermostat mode switch in the "COOL" position. Slowly reduce thermostat setting until the compressor activates.
    b. Check for cool air delivery at the unit grille within a few minutes after the unit has begun to operate. **Note: Units have a five minute time delay in the control circuit that can be eliminated on the CXM/DXM control board as shown below in Figure 25. See controls description for details.**
    c. Check the elevation and cleanliness of the condensate lines. Dripping may be a sign of a blocked line. Check that the condensate trap is filled to provide a water seal.
    d. Refer to Table 9. Check the temperature of both entering and leaving water. If temperature is within range, proceed with the test. If temperature is outside of the operating range, check refrigerant pressures.
    e. Check air temperature drop across the air coil when compressor is operating. Air temperature drop should be between 15°F and 25°F [8°C and 14°C].
    f. Turn thermostat to "OFF" position. A hissing noise indicates proper functioning of the reversing valve.
6. Allow five (5) minutes between tests for pressure to equalize before beginning heating test.
    a. Adjust the thermostat to the lowest setting. Place the thermostat mode switch in the "HEAT" position.
    b. Slowly raise the thermostat to a higher temperature until the compressor activates.
    c. Check for warm air delivery within a few minutes after the unit has begun to operate.
    d. Refer to Table 9. Check the temperature of both entering and leaving water. If temperature is within range, proceed with the test. If temperature is outside of the operating range, check refrigerant pressures.
    e. Check air temperature rise across the air coil when compressor is operating. Air temperature rise should be between 20°F and 30°F [11°C and 17°C].
    f. Check for vibration, noise, and water leaks.
7. Cabinets with optional electric heat (model with digit 7:1-9). Raise the thermostat setting additional 5 to10 degrees. After 2 minutes, discharge air temperature should be higher than in step 6. Select emergency heat mode then wait 2 minutes and air temperature should be warm.
8. If unit fails to operate, perform troubleshooting analysis (see troubleshooting section). If the check described fails to reveal the problem and the unit still does not operate, contact a trained service technician to ensure proper diagnosis and repair of the equipment.
9. When testing is complete, set system to maintain desired comfort level.
10. BE CERTAIN TO FILL OUT AND FORWARD ALL WARRANTY REGISTRATION PAPERS TO CLIMATEMASTER.

Note: If performance during any mode appears abnormal, refer to the CXM and DXM sections or troubleshooting section of this manual. To obtain maximum performance, the air coil should be cleaned before start-up. A 10% solution of dishwasher detergent and water is recommended.

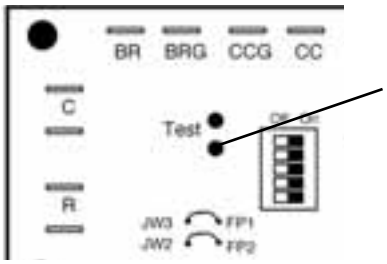
⚠ WARNING! ⚠

WARNING! When the disconnect switch is closed, high voltage is present in some areas of the electrical panel. Exercise caution when working with energized equipment.

⚠ CAUTION! ⚠

CAUTION! Verify that ALL water control valves are open and allow water flow prior to engaging the compressor. Freezing of the coax or water lines can permanently damage the heat pump.

Figure 25: Test Mode Pins



Short test pins together to enter Test Mode and speed-up timing and delays for 20 minutes.

Unit Operating Conditions

Note: Table 10 includes the following notes:

- Airflow is at nominal (rated) conditions;
- Entering air is based upon 70°F [21°C] DB in heating and 80/67°F [27/19°C] in cooling;
- Subcooling is based upon head pressure at compressor service port;
- Cooling air and water values can vary greatly with changes in humidity level.

Table 10: TRM Series Typical Operating Pressures and Temperatures (60 Hz I-P Units)

TRM09		Full Load Cooling						TRM09		Full Load Heating					
Entering Water Temp °F	Water Flow GPM/ Ton	Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Drop °F	Air Temp Rise °F DB	Entering Water Temp °F	Water Flow GPM/ton	Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5 2.25 3	114-124 111-121 109-119	142-162 132-152 122-142	24-29 26-31 28-33	3-8 3-8 3-8	15.2-17.2 11.4-13.4 7.5-9.5	17-23 17-23 17-23	30	1.5 2.25 3	75-85 78-88 81-91	272-292 274-294 276-296	13-18 13-18 13-18	4-9 4-9 4-9	5.9-7.9 4.3-6.3 2.7-4.7	16-22 16-22 17-23
50	1.5 2.25 3	130-140 129-139 128-138	190-210 180-200 170-190	14-19 16-21 19-24	2-7 2-7 2-7	16.5-18.5 12.3-14.3 8-10	18-24 18-24 18-24	50	1.5 2.25 3	104-114 112-122 120-130	299-319 304-324 308-328	12-17 12-17 12-17	6-11 4-9 3-8	8.8-10.8 6.7-8.7 4.5-6.5	21-27 22-28 23-29
70	1.5 2.25 3	143-153 141-151 140-150	265-285 252-272 240-260	9-14 10-15 11-16	2-7 2-7 2-7	15.5-17.5 11.5-13.5 7.5-9.5	18-24 18-24 18-24	70	1.5 2.25 3	129-139 144-154 159-169	321-341 330-350 340-360	11-16 13-18 15-20	7-12 4-9 3-8	11.2-13.2 8.8-10.8 6.3-8.3	25-31 27-33 28-34
90	1.5 2.25 3	149-159 149-159 148-158	340-370 335-355 320-340	8-13 8-13 8-13	2-7 2-7 2-7	14.2-16.2 10.6-12.6 7-9	17-23 17-23 17-23	90	1.5 2.25 3	163-173 180-190 198-208	349-369 360-380 372-392	13-18 11-16 10-15	7-12 4-9 3-8	14.3-16.3 11.2-13.2 8.1-10.1	30-36 32-38 34-40
110	1.5 2.25 3	154-164 154-164 153-163	451-471 428-448 405-425	8-13 8-13 8-13	2-7 2-7 2-7	12.7-14.7 9.5-11.5 6.5-8.5	15-21 15-21 15-21	110	1.5 2.25 3						

TRM12		Full Load Cooling						TRM12		Full Load Heating					
Entering Water Temp °F	Water Flow GPM/ Ton	Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Drop °F	Air Temp Rise °F DB	Entering Water Temp °F	Water Flow GPM/ton	Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5 2.25 3	126-136 126-136 126-136	161-181 146-166 131-151	17-22 17-22 17-22	8-13 7-12 6-11	19.8-21.8 14.9-16.9 9.9-11.9	21-27 21-27 21-27	30	1.5 2.25 3	74-84 77-87 79-89	278-298 280-300 283-303	6-11 6-11 6-11	4-9 4-9 3-8	6.1-8.1 4.5-6.5 2.8-4.8	18-24 18-24 19-25
50	1.5 2.25 3	132-142 132-142 132-142	215-235 200-220 185-205	10-15 10-15 10-15	8-13 7-12 6-11	18.8-20.8 14.1-16.1 9.4-11.4	20-26 20-26 20-26	50	1.5 2.25 3	104-114 106-116 108-118	309-329 312-332 315-335	8-12 8-12 8-12	7-12 7-12 7-12	9.6-11.6 7-9 4.5-6.5	24-30 24-30 25-31
70	1.5 2.25 3	138-148 138-148 137-147	278-298 263-283 248-268	8-13 8-13 8-13	9-14 8-13 7-12	17.7-19.7 13.1-15.1 8.5-10.5	19-25 19-25 19-25	70	1.5 2.25 3	127-137 132-142 138-148	332-352 340-360 347-367	10-15 11-16 13-18	10-15 10-15 10-15	12-14 9-10 6.1-8.1	29-35 29-35 30-36
90	1.5 2.25 3	142-152 142-152 142-152	365-385 351-371 337-357	8-13 8-13 8-13	9-14 8-13 7-12	16-18 12-14 8-10	18-24 18-24 18-24	90	1.5 2.25 3	164-174 165-175 167-177	372-392 375-395 379-399	17-22 18-23 19-24	13-18 13-18 13-18	14.5-16.5 11.2-13.2 7.9-9.9	35-41 35-41 36-42
110	1.5 2.25 3	150-160 150-160 150-160	439-459 439-459 439-459	17-22 17-22 17-22	9-14 8-13 7-12	14.2-16.2 10.6-12.6 6.9-8.9	17-23 17-23 17-23	110	1.5 2.25 3						

TRM15		Full Load Cooling						TRM15		Full Load Heating					
Entering Water Temp °F	Water Flow GPM/ Ton	Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Drop °F	Air Temp Rise °F DB	Entering Water Temp °F	Water Flow GPM/ton	Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5 2.25 3	98-108 98-108 99-109	140-160 135-155 127-148	36-41 36-41 36-41	14-19 12-17 10-15	17.1-19.1 12.5-14.5 7.9-9.9	19-25 19-25 19-25	30	1.5 2.25 3	72-82 85-95 78-88	301-321 304-324 308-328	9-14 9-14 9-14	12-17 12-17 12-17	6.5-8.5 4.7-6.7 2.9-4.9	21-27 21-27 22-28
50	1.5 2.25 3	118-128 118-128 118-128	215-235 200-220 185-205	22-27 22-27 22-27	14-19 12-17 10-15	18.1-20.1 13.1-15.1 8.1-10.1	20-26 20-26 19-25	50	1.5 2.25 3	100-110 98-108 95-105	337-357 334-354 332-352	10-15 10-15 11-16	15-20 15-20 15-20	9.5-11.5 6.6-8.6 3.8-5.8	26-32 26-32 26-32
70	1.5 2.25 3	132-142 132-142 132-142	300-320 263-282 245-265	11-16 11-16 12-17	12-17 10-15 7-12	17-19 12.6-14.6 8.2-10.2	19-25 19-25 19-25	70	1.5 2.25 3	115-125 112-122 110-120	361-381 360-380 356-376	19-24 20-25 21-26	18-23 18-23 18-23	11.1-13.1 8-10 4.8-6.8	29-35 29-35 29-35
90	1.5 2.25 3	138-148 138-148 138-148	366-386 353-373 340-360	9-14 9-14 9-14	11-16 9-14 6-11	15.8-17.8 14.9-16.9 14-16	18-24 18-24 18-24	90	1.5 2.25 3	122-132 123-133 124-134	376-396 378-398 380-400	34-39 36-41 38-43	22-27 22-27 23-28	12.1-14.1 9-11 5.8-7.8	32-38 32-38 32-38
110	1.5 2.25 3	145-155 145-155 145-155	453-473 442-462 431-451	9-14 9-14 9-14	9-14 7-12 5-10	14.7-16.7 10.8-12.8 6.8-8.8	16-22 16-22 17-23	110	1.5 2.25 3						

Table Continued on Next Page

Table 10: TRM Series Typical Operating Pressures and Temperatures (60 Hz I-P Units)

TRM18		Full Load Cooling						TRM18		Full Load Heating					
Entering Water Temp °F	Water Flow GPM/ Ton	Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Drop °F	Air Temp Rise °F DB	Entering Water Temp °F	Water Flow GPM/ton	Suction Pressure PSIG	Dis-charge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5 2.25 3	126-136 126-136 126-136	161-181 146-166 131-151	17-22 17-22 17-22	8-13 7-12 6-11	19.8-21.8 14.9-16.9 9.9-11.9	21-27 21-27 21-27	30	1.5 2.25 3	75-85 78-88 81-91	272-292 274-294 276-296	13-18 13-18 13-18	4-9 4-9 4-9	5.9-7.9 4.3-6.3 2.7-4.7	16-22 16-22 17-23
50	1.5 2.25 3	132-142 132-142 132-142	215-235 200-220 185-205	10-15 10-15 10-15	8-13 7-12 6-11	18.8-20.8 14.1-16.1 9.4-11.4	20-26 20-26 20-26	50	1.5 2.25 3	104-114 112-122 120-130	299-319 304-324 308-328	12-17 12-17 12-17	6-11 4-9 3-8	8.8-10.8 6.7-8.7 4.5-6.5	21-27 22-28 23-29
70	1.5 2.25 3	138-148 138-148 137-147	278-298 263-283 248-268	8-13 8-13 8-13	9-14 8-13 7-12	17.7-19.7 13.1-15.1 8.5-10.5	19-25 19-25 19-25	70	1.5 2.25 3	129-139 144-154 159-169	321-341 330-350 340-360	11-16 13-18 15-20	7-12 4-9 3-8	11.2-13.2 8.8-10.8 6.3-8.3	25-31 27-33 28-34
90	1.5 2.25 3	142-152 142-152 142-152	365-385 351-371 337-357	8-13 8-13 8-13	9-14 8-13 7-12	16-18 12-14 8-10	18-24 18-24 18-24	90	1.5 2.25 3	163-173 180-190 198-208	349-369 360-380 372-392	13-18 11-16 10-15	7-12 4-9 3-8	14.3-16.3 11.2-13.2 8.1-10.1	30-36 32-38 34-40
110	1.5 2.25 3	150-160 150-160 150-160	439-459 439-459 439-459	7-12 7-12 7-12	9-14 8-13 7-12	14.2-16.2 10.6-12.6 6.9-8.9	17-23 17-23 17-23	110	1.5 2.25 3						

TRM24		Full Load Cooling						TRM24		Full Load Heating					
Entering Water Temp °F	Water Flow GPM/ Ton	Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Drop °F	Air Temp Rise °F DB	Entering Water Temp °F	Water Flow GPM/ton	Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cool-ing	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5 2.25 3	126-136 126-136 126-136	161-181 146-166 131-151	17-22 17-22 17-22	8-13 7-12 6-11	19.8-21.8 14.9-16.9 9.9-11.9	21-27 21-27 21-27	30	1.5 2.25 3	75-85 78-88 81-91	272-292 274-294 276-296	13-18 13-18 13-18	4-9 4-9 4-9	5.9-7.9 4.3-6.3 2.7-4.7	16-22 16-22 17-23
50	1.5 2.25 3	132-142 132-142 132-142	215-235 200-220 185-205	10-15 10-15 10-15	8-13 7-12 6-11	18.8-20.8 14.1-16.1 9.4-11.4	20-26 20-26 20-26	50	1.5 2.25 3	104-114 112-122 120-130	299-319 304-324 308-328	12-17 12-17 12-17	6-11 4-9 3-8	8.8-10.8 6.7-8.7 4.5-6.5	21-27 22-28 23-29
70	1.5 2.25 3	138-148 138-148 137-147	278-298 263-283 248-268	8-13 8-13 8-13	9-14 8-13 7-12	17.7-19.7 13.1-15.1 8.5-10.5	19-25 19-25 19-25	70	1.5 2.25 3	129-139 144-154 159-169	321-341 330-350 340-360	11-16 13-18 15-20	7-12 4-9 3-8	11.2-13.2 8.8-10.8 6.3-8.3	25-31 27-33 28-34
90	1.5 2.25 3	142-152 142-152 142-152	365-385 351-371 337-357	8-13 8-13 8-13	9-14 8-13 7-12	16-18 12-14 8-10	18-24 18-24 18-24	90	1.5 2.25 3	163-173 180-190 198-208	349-369 360-380 372-392	13-18 11-16 10-15	7-12 4-9 3-8	14.3-16.3 11.2-13.2 8.1-10.1	30-36 32-38 34-40
110	1.5 2.25 3	150-160 150-160 150-160	439-459 439-459 439-459	7-12 7-12 7-12	9-14 8-13 7-12	14.2-16.2 10.6-12.6 6.9-8.9	17-23 17-23 17-23	110	1.5 2.25 3						

TRM30		Full Load Cooling						TRM30		Full Load Heating					
Entering Water Temp °F	Water Flow GPM/ Ton	Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Drop °F	Air Temp Rise °F DB	Entering Water Temp °F	Water Flow GPM/ ton	Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5 2.25 3	126-136 126-136 126-136	161-181 146-166 131-151	17-22 17-22 17-22	8-13 7-12 6-11	19.8-21.8 14.9-16.9 9.9-11.9	21-27 21-27 21-27	30	1.5 2.25 3	75-85 78-88 81-91	272-292 274-294 276-296	13-18 13-18 13-18	4-9 4-9 4-9	5.9-7.9 4.3-6.3 2.7-4.7	16-22 16-22 17-23
50	1.5 2.25 3	132-142 132-142 132-142	215-235 200-220 185-205	10-15 10-15 10-15	8-13 7-12 6-11	18.8-20.8 14.1-16.1 9.4-11.4	20-26 20-26 20-26	50	1.5 2.25 3	104-114 112-122 120-130	299-319 304-324 308-328	12-17 12-17 12-17	6-11 4-9 3-8	8.8-10.8 6.7-8.7 4.5-6.5	21-27 22-28 23-29
70	1.5 2.25 3	138-148 138-148 137-147	278-298 263-283 248-268	8-13 8-13 8-13	9-14 8-13 7-12	17.7-19.7 13.1-15.1 8.5-10.5	19-25 19-25 19-25	70	1.5 2.25 3	129-139 144-154 159-169	321-341 330-350 340-360	11-16 13-18 15-20	7-12 4-9 3-8	11.2-13.2 8.8-10.8 6.3-8.3	25-31 27-33 28-34
90	1.5 2.25 3	142-152 142-152 142-152	365-385 351-371 337-357	8-13 8-13 8-13	9-14 8-13 7-12	16-18 12-14 8-10	18-24 18-24 18-24	90	1.5 2.25 3	163-173 180-190 198-208	349-369 360-380 372-392	13-18 11-16 10-15	7-12 4-9 3-8	14.3-16.3 11.2-13.2 8.1-10.1	30-36 32-38 34-40
110	1.5 2.25 3	150-160 150-160 150-160	439-459 439-459 439-459	7-12 7-12 7-12	9-14 8-13 7-12	14.2-16.2 10.6-12.6 6.9-8.9	17-23 17-23 17-23	110	1.5 2.25 3						

Table Continued on Next Page

Table 10: TRM Series Typical Operating Pressures and Temperatures (60 Hz I-P Units)

TRM36		Full Load Cooling						TRM36		Full Load Heating					
Entering Water Temp °F	Water Flow GPM/ Ton	Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Drop °F	Air Temp Rise °F DB	Entering Water Temp °F	Water Flow GPM/ton	Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5 2.25 3	126-136 126-136 126-136	161-181 146-166 131-151	17-22 17-22 17-22	8-13 7-12 6-11	19.8-21.8 14.9-16.9 9.9-11.9	21-27 21-27 21-27	30	1.5 2.25 3	75-85 78-88 81-91	272-292 274-294 276-296	13-18 13-18 13-18	4-9 4-9 4-9	5.9-7.9 4.3-6.3 2.7-4.7	16-22 16-22 17-23
50	1.5 2.25 3	132-142 132-142 132-142	215-235 200-220 185-205	10-15 10-15 10-15	8-13 7-12 6-11	18.8-20.8 14.1-16.1 9.4-11.4	20-26 20-26 20-26	50	1.5 2.25 3	104-114 112-122 120-130	299-319 304-324 308-328	12-17 12-17 12-17	6-11 4-9 3-8	8.8-10.8 6.7-8.7 4.5-6.5	21-27 22-28 23-29
70	1.5 2.25 3	138-148 138-148 137-147	278-298 263-283 248-268	8-13 8-13 8-13	9-14 8-13 7-12	17.7-19.7 13.1-15.1 8.5-10.5	19-25 19-25 19-25	70	1.5 2.25 3	129-139 144-154 159-169	321-341 330-350 340-360	11-16 13-18 15-20	7-12 4-9 3-8	11.2-13.2 8.8-10.8 6.3-8.3	25-31 27-33 28-34
90	1.5 2.25 3	142-152 142-152 142-152	365-385 351-371 337-357	8-13 8-13 8-13	9-14 8-13 7-12	16-18 12-14 8-10	18-24 18-24 18-24	90	1.5 2.25 3	163-173 180-190 198-208	349-369 360-380 372-392	13-18 11-16 10-15	7-12 4-9 3-8	14.3-16.3 11.2-13.2 8.1-10.1	30-36 32-38 34-40
110	1.5 2.25 3	150-160 150-160 150-160	439-459 439-459 439-459	7-12 7-12 7-12	9-14 8-13 7-12	14.2-16.2 10.6-12.6 6.9-8.9	17-23 17-23 17-23	110	1.5 2.25 3						

Table 11: Coax Water Pressure Drop

Model	GPM	Pressure Drop, PSI				PD Added for Motorized Water Valve
		30°F	50°F	70°F	90°F	
TRC09	1.1 1.7 2.3	0.6 1.7 3.3	0.5 1.5 2.9	0.5 1.4 2.8	0.4 1.3 2.5	0.25 0.64 1.27
TRC12	1.5 2.3 3.0	1.4 3.2 5.8	1.2 2.8 5.1	1.1 2.5 4.6	0.9 2.2 4.2	0.46 1.17 2.16
TRC15	1.9 2.8 3.8	0.3 0.6 1.8	0.3 0.5 1.5	0.2 0.4 1.3	0.2 0.4 1.2	0.74 1.74 2.16
TRC18	2.3 3.4 4.5	0.7 1.8 3.5	0.6 1.6 2.9	0.5 1.3 2.5	0.4 1.2 2.3	0.24 0.58 1.10
TRC24	3.0 4.5 6.0	1.3 2.4 4.6	1.2 2.1 4.1	1.1 1.8 3.6	1.0 1.6 3.3	0.42 1.02 1.96
TRC30	3.8 5.6 7.5	1.0 2.9 5.5	0.9 2.8 5.3	0.8 2.0 3.8	0.6 1.9 3.6	0.67 1.58 3.06
TRC36	4.5 6.8 9.0	2.5 5.2 8.6	2.1 4.4 7.4	1.9 4.0 6.6	1.7 4.0 5.9	0.93 2.32 4.40

Start-Up Log Sheet

Installer: Complete unit and system checkout and follow unit start-up procedures in the IOM. Use this form to record unit information, temperatures and pressures during start-up. Keep this form for future reference.

Job Name:_____ **Street Address:**_____

Chassis Model Number: _____**Serial Number:**_____

Cabinet Model Number: _____**Serial Number:**_____

Unit Location in Building:_____

Date: _____**Sales Order No:** _____

In order to minimize troubleshooting and costly system failures, complete the following checks and data entries before the system is put into full operation.

Motor Speed(s): _____ **Antifreeze:** _____**%**
Temperatures: F or C **Type:** _____

Pressures: PSIG or kPa

	Cooling Mode		Heating Mode
Return-Air Temperature	DB	WB	DB
Supply-Air Temperature	DB	WB	DB
Temperature Differential			
Entering Fluid Temperature			
Leaving Fluid Temperature			
Temperature Differential			
Water Coil Heat Exchanger (Water Pressure IN)			
Water Coil Heat Exchanger (Water Pressure OUT)			
Pressure Differential			
Flow Rate GPM (l/s)			
Compressor			
Amps			
Volts			
Discharge Line Temperature			
Motor			
Amps			
Volts			

Allow unit to run 15 minutes in each mode before taking data.

Do not connect gauge lines

Preventive Maintenance

Water Coil Maintenance
(Direct ground water applications only)
If the system is installed in an area with a known high mineral content (125 P.P.M. or greater) in the water, it is best to establish a periodic maintenance schedule with the owner so the coil can be checked regularly. Consult the well water applications section of this manual for a more detailed water coil material selection. Should periodic coil cleaning be necessary, use standard coil cleaning procedures, which are compatible with the heat exchanger material and copper water lines. Generally, the more water flowing through the unit, the less chance for scaling. Therefore, 1.5 gpm per ton [2.0 l/m per kW] is recommended as a minimum flow. Minimum flow rate for entering water temperatures below 50°F [10°C] is 2.0 gpm per ton [2.6 l/m per kW].

Water Coil Maintenance
(All other water loop applications)
Generally water coil maintenance is not needed for closed loop systems. However, if the piping is known to have high dirt or debris content, it is best to establish a periodic maintenance schedule with the owner so the water coil can be checked regularly. Dirty installations are typically the result of deterioration of iron or galvanized piping or components in the system. Open cooling towers requiring heavy chemical treatment and mineral buildup through water use can also contribute to higher maintenance. Should periodic coil cleaning be necessary, use standard coil cleaning procedures, which are compatible with both the heat exchanger material and copper water lines. Generally, the more water flowing through the unit, the less chance for scaling. However, flow rates over 3 gpm per ton (3.9 l/m per kW) can produce water (or debris) velocities that can erode the heat exchanger wall and ultimately produce leaks.

Filters - Filters must be clean to obtain maximum performance. Filters should be inspected every month under normal operating conditions and be replaced when necessary. Units should never be operated without a filter.

Washable, high efficiency, electrostatic filters, when dirty, can exhibit a very high pressure drop for the fan motor and reduce air flow, resulting in poor performance. It is especially important to provide consistent washing of these filters (in the opposite direction of the normal air flow) once per month using a high pressure wash similar to those found at self-serve car washes.

Condensate Drain - In areas where airborne bacteria may produce a "slimy" substance in the drain pan, it may be necessary to treat the drain pan chemically with an algaecide approximately every three months to minimize the problem. The condensate pan may also need to be cleaned periodically to ensure indoor air quality. The condensate drain can pick up lint and dirt, especially with dirty filters. Inspect the drain twice a year to avoid the possibility of plugging and eventual overflow.

Compressor - Conduct annual amperage checks to ensure that amp draw is no more than 10% greater than indicated on the serial plate data.

Fan Motors - All units have lubricated fan motors. Fan motors should never be lubricated unless obvious, dry operation is suspected. Periodic maintenance oiling is not recommended, as it will result in dirt accumulating in the excess oil and cause eventual motor failure. Conduct annual dry operation check and amperage check to ensure amp draw is no more than 10% greater than indicated on serial plate data.

Air Coil - The air coil must be cleaned to obtain maximum performance. Check once a year under normal operating conditions and, if dirty, brush or vacuum clean. Care must be taken not to damage the aluminum fins while cleaning. CAUTION: Fin edges are sharp.

Cabinet - Check inside cabinet once a year. Gently brush or vacuum clean if needed. Do not tear insulation.

Refrigerant System - To maintain sealed circuit integrity, do not install service gauges unless unit operation appears abnormal. Reference the operating charts for pressures and temperatures. Verify that air and water flow rates are at proper levels before servicing the refrigerant circuit.

Functional Troubleshooting

Fault	Htg	Clg	Possible Cause	Solution
Main power problems	X	X	Green Status LED Off	Check line voltage circuit breaker and disconnect.
				Check for line voltage between L1 and L2 on the contactor.
				Check for 24VAC between R and C on CXM/DXM'
				Check primary/secondary voltage on transformer.
HP Fault Code 2 **High Pressure**		X	Reduced or no water flow in cooling	Check pump operation or valve operation/setting.
				Check water flow adjust to proper flow rate.
		X	Water Temperature out of range in cooling	Bring water temp within design parameters.
	X		Reduced or no air flow in heating	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Dirty Air Coil- construction dust etc.
				Too high of external static. Check static vs blower table.
	X		Air temperature out of range in heating	Bring return air temp within design parameters.
	X	X	Overcharged with refrigerant	Check superheat/subcooling vs typical operating condition table.
	X	X	Bad HP Switch	Check switch continuity and operation. Replace.
LP/LOC Fault Code 3 **Low Pressure / Loss of Charge**	X	X	Insufficient charge	Check for refrigerant leaks
	X		Compressor pump down at start-up	Check charge and start-up water flow.
LT1 Fault Code 4 **Water coil low temperature limit**	X		Reduced or no water flow in heating	Check pump operation or water valve operation/setting.
				Plugged strainer or filter. Clean or replace..
				Check water flow adjust to proper flow rate.
	X		Inadequate antifreeze level	Check antifreeze density with hydrometer.
	X		Improper temperature limit setting (30°F vs 10°F [-1°C vs -2°C])	Clip JW3 jumper for antifreeze (10°F [-12°C]) use.
	X		Water Temperature out of range	Bring water temp within design parameters.
	X	X	Bad thermistor	Check temp and impedance correlation per chart
LT2 Fault Code 5 **Air coil low temperature limit**		X	Reduced or no air flow in cooling	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Too high of external static. Check static vs blower table.
		X	Air Temperature out of range	Too much cold vent air? Bring entering air temp within design parameters.
		X	Improper temperature limit setting (30°F vs 10°F [-1°C vs -12°C])	Normal airside applications will require 30°F [-1°C] only.
	X	X	Bad thermistor	Check temp and impedance correlation per chart.
Condensate Fault Code 6	X	X	Blocked drain	Check for blockage and clean drain.
	X	X	Improper trap	Check trap dimensions and location ahead of vent.
		X	Poor drainage	Check for piping slope away from unit.
				Check slope of unit toward outlet.
				Poor venting. Check vent location.
		X	Moisture on sensor	Check for moisture shorting to air coil.
	X	X	Plugged air filter	Replace air filter.
	x	X	Restricted Return Air Flow	Find and eliminate restriction. Increase return duct and/or grille size.
Over/Under Voltage Code 7 **(Auto resetting)**	X	X	Under Voltage	Check power supply and 24VAC voltage before and during operation.
				Check power supply wire size.
				Check compressor starting. Need hard start kit?
				Check 24VAC and unit transformer tap for correct power supply voltage.
	X	X	Over Voltage	Check power supply voltage and 24VAC before and during operation.
				Check 24VAC and unit transformer tap for correct power supply voltage.
Unit Performance Sentinel Code 8	X		Heating mode FP2>125°F [52°C]	Check for poor air flow or overcharged unit.
		X	Cooling Mode FP1>125°F [52°C] OR FP2< 40ºF [4ºC])	Check for poor water flow, or air flow.
No Fault Code Shown	X	X	No compressor operation	See "Only Fan Operates".
	X	X	Compressor overload	Check and replace if necessary.
	X	X	Control board	Reset power and check operation.
Unit Short Cycles	X	X	Dirty air filter	Check and clean air filter.
	X	X	Unit in "test mode"	Reset power or wait 20 minutes for auto exit.
	X	X	Unit selection	Unit may be oversized for space. Check sizing for actual load of space.
	X	X	Compressor overload	Check and replace if necessary
Only Fan Runs	X	X	Thermostat position	Ensure thermostat set for heating or cooling operation.
	X	X	Unit locked out	Check for lockout codes. Reset power.
	X	X	Compressor Overload	Check compressor overload. Replace if necessary.
	X	X	Thermostat wiring	Check thermostat wiring at heat pump. Jumper Y and R for compressor operation in test mode.
Only Compressor Runs	X	X	Thermostat wiring	Check G wiring at heat pump. Jumper G and R for fan operation
	X	X	Fan motor relay	Jumper G and R for fan operation. Check for Line voltage across BR contacts.
	X	X		Check fan power enable relay operation (if present).
	X	X	Fan motor	Check for line voltage at motor. Check capacitor.
	X	X	Thermostat wiring	Check thermostat wiring at heat pump. Jumper Y and R for compressor operation in test mode
Unit Doesn't Operate in Cooling		X	Reversing valve	Set for cooling demand and check 24VAC on RV coil and at CXM/DXM board.
				If RV is stuck, run high pressure up by reducing water flow and while operating engage and disengage RV coil voltage to push valve.
		X	Thermostat setup	Check for 'O' RV setup not 'B'.
		X	Thermostat wiring	Check O wiring at heat pump. Jumper O and R for RV coil 'click'.
		X	Thermostat wiring	Put thermostat in cooling mode. Check 24 VAC on O (check between C and O); check for 24 VAC on W (check between W and C). There should be voltage on O, but not on W. If voltage is present on W, thermostat may be bad or wired incorrectly.

Performance Troubleshooting

Performance Troubleshooting	Htg	Clg	Possible Cause	Solution
Insufficient capacity/ Not cooling or heating	X	X	Dirty filter	Replace or clean.
	X		Reduced or no air flow in heating	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Too high of external static. Check static vs. blower table.
		X	Reduced or no air flow in cooling	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Too high of external static. Check static vs. blower table.
	X	X	Leaky duct work	Check supply and return air temperatures at the unit and at distant duct registers if significantly different, duct leaks are present.
	X	X	Low refrigerant charge	Check superheat and subcooling per chart.
	X	X	Restricted metering device	Check superheat and subcooling per chart. Replace.
		X	Defective reversing valve	Perform RV touch test.
	X	X	Thermostat improperly located	Check location and for air drafts behind stat.
	X	X	Unit undersized	Recheck loads & sizing. Check sensible clg. load and heat pump capacity.
	X	X	Scaling in water heat exchanger	Perform scaling check and clean if necessary.
	X	X	Inlet water too hot or too cold	Check load, loop sizing, loop backfill, ground moisture.
High Head Pressure	X		Reduced or no air flow in heating	Check for dirty air filter and clean or replace.
				Check fan motor operation and air flow restrictions.
				Too high of external static. Check static vs. blower table.
		X	Reduced or no water flow in cooling	Check pump operation or valve operation/setting.
				Check water flow. Adjust to proper flow rate.
		X	Inlet water too hot	Check load, loop sizing, loop backfill, ground moisture.
	X		Air temperature out of range in heating	Bring return air temperature within design parameters.
		X	Scaling in water heat exchanger	Perform scaling check and clean if necessary.
	X	X	Unit overcharged	Check superheat and subcooling. Re-weigh in charge.
	X	X	Non-condensables in system	Vacuum system and re-weigh in charge.
	X	X	Restricted metering device.	Check superheat and subcooling per chart. Replace.
Low Suction Pressure	X		Reduced water flow in heating.	Check pump operation or water valve operation/setting.
				Plugged strainer or filter. Clean or replace.
				Check water flow. Adjust to proper flow rate.
	X		Water temperature out of range.	Bring water temperature within design parameters.
		X	Reduced air flow in cooling.	Check for dirty air filter and clean or replace.
				Check fan motor operation and air flow restrictions.
				Too high of external static. Check static vs. blower table.
		X	Air temperature out of range	Too much cold vent air? Bring entering air temperature within design parameters.
	X	X	Insufficient charge	Check for refrigerant leaks.
Low Discharge Air Temperature in Heating	X		Too high of air flow	Check fan motor speed selection and air flow chart.
	X		Poor performance	See 'Insufficient Capacity'
High humidity		X	Too high of air flow	Check fan motor speed selection and airflow chart.
		X	Unit oversized	Recheck loads & sizing. Check sensible clg load and heat pump capacity.

Vertical Stack

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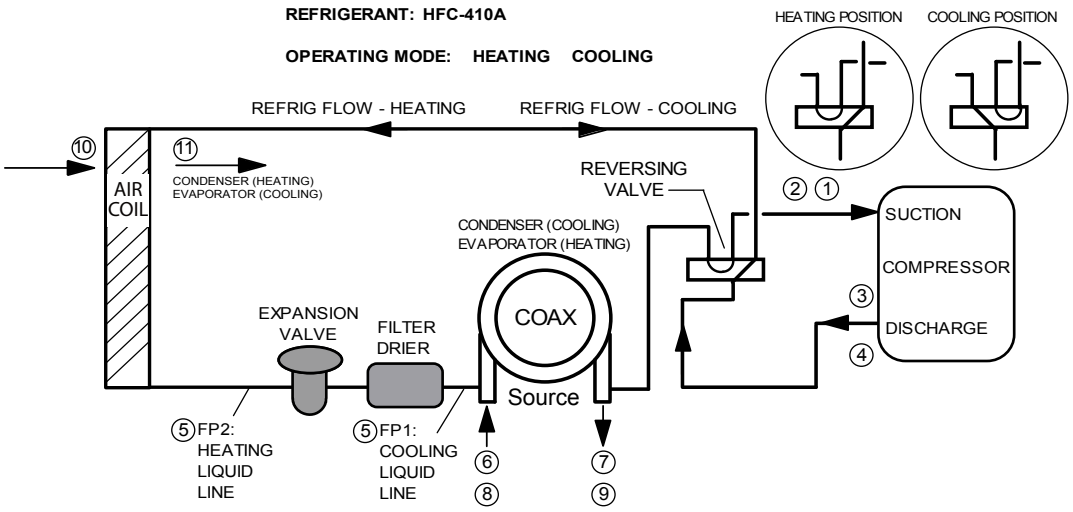
Troubleshooting Form

Customer: _____ Loop Type: _____ Startup Date: _____

Model #: _____ Serial #: _____ Antifreeze Type & %: _____

Complaint: _____



Description	Heating	Cooling	Notes
Voltage			
Compressor Amps			
1 Suction Temp			
2 Suction Press			
2a Saturation Temp			
2b Superheat			
3 Discharge Temp			
4 Discharge Press			
4a Saturation Temp			
4b Subcooling			
5 Liquid Line Temp			
6 Source Water In Tmp			
7 Source Water Out Tmp			Temp Diff. =
8 Source Water In Pres			
9 Source Water Out Pres			
9a Press Drop			
9b Flow Rate			
10 Return Air Temp			
11 Supply Air Temp			

Heat of Extraction (Absorption) or Heat of Rejection:

Fluid Factor: (for Btuh)	Fluid Factor: (for kW)
500 (Water); 485 (Antifreeze)	4.18 (Water); 4.05 (Antifreeze)

HE or HR =

_____ Flow Rate x _____ Temp. Diff x _____ Fluid Factor

Superheat = Suction temperature - suction saturation temp. = _____ (deg F)

Subcooling = Discharge saturation temp. - liquid line temp. = _____ (deg F)

Note: Never connect refrigerant gauges during startup procedures. Conduct water-side analysis using P/T ports to determine water flow and temperature difference. If water-side analysis shows poor performance, refrigerant troubleshooting may be required. Connect refrigerant gauges as a last resort.

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GRANT OF LIMITED EXPRESS WARRANTY
CM warrants CM products purchased and retained in the United States of America and Canada to be free from defects in material and workmanship under normal use and maintenance as follows: (1) All complete air conditioning, heating and/or heat pump units built or sold by CM for twelve (12) months from date of unit start up or eighteen (18) months from date of shipment (from factory), whichever comes first; (2) Repair and replacement parts, which are not supplied under warranty, for nintey (90) days from date of shipment (from factory). All parts must be returned to CM's factory in Oklahoma City, Oklahoma, freight prepaid, no later than sixty (60) days after the date of the failure of the part; if CM determines the part to be defective and within CM's Limited Express Warranty, CM shall, when such part has been either replaced or repaired, return such to a factory recognized dealer, contractor or service organization, F.O.B. CM's factory, Oklahoma City, Oklahoma, freight prepaid. The warranty on any parts repaired or replaced under warranty expires at the end of the original warranty period.

This warranty does not cover and does not apply to: (1) Air filters, fuses, refrigerant, fluids, oil; (2) Products relocated after initial installation; (3) Any portion or component of any system that is not supplied by CM, regardless of the cause of the failure of such portion or component; (4) Products on which the unit identification tags or labels have been removed or defaced; (5) Products on which payment to CM is or has been in default; (6) Products which have defects or damage which result from improper installation, wiring, electrical imbalance characteristics or maintenance; or are caused by accident, misuse or abuse, fire, flood, alteration or misapplication of the product; (7) Products which have defects or damage which result from a contaminated or corrosive air or liquid supply, operation at abnormal temperatures, or unauthorized opening of refrigerant circuit; (8) Mold, fungus or bacteria damages; (9) Products subjected to corrosion or abrasion; (10) Products manufactured or supplied by others; (11) Products which have been subjected to misuse, negligence or accidents; (12) Products which have been operated in a manner contrary to CM's printed instructions; or (13) Products which have defects, damage or insufficient performance as a result of insufficient or incorrect system design or the improper application of CM's products.

CM is not responsible for: (1) The costs of any fluids, refrigerant or other system components, or associated labor to repair or replace the same, which is incurred as a result of a defective part covered by CM's Limited Express Warranty; (2) The costs of labor, refrigerant, materials or service incurred in removal of the defective part, or in obtaining and replacing the new or repaired part; or, (3) Transportation costs of the defective part from the installation site to CM or of the return of any part not covered by CM's Limited Express Warranty.

Limitation: This Limited Express Warranty is given in lieu of all other warranties. If, notwithstanding the disclaimers contained herein, it is determined that other warranties exist, any such warranties, including without limitation any express warranties or any implied warranties of fitness for particular purpose and merchantability, shall be limited to the duration of the Limited Express Warranty.

LIMITATION OF REMEDIES
In the event of a breach of the Limited Express Warranty, CM will only be obligated at CM's option to repair the failed part or unit or to furnish a new or rebuilt part or unit in exchange for the part or unit which has failed. If after written notice to CM's factory in Oklahoma City, Oklahoma of each defect, malfunction or other failure and a reasonable number of attempts by CM to correct the defect, malfunction or other failure and the remedy fails of its essential purpose, CM shall refund the purchase price paid to CM in exchange for the return of the sold good(s). Said refund shall be the maximum liability of CM. **THIS REMEDY IS THE SOLE AND EXCLUSIVE REMEDY OF THE BUYER OR THEIR PURCHASER AGAINST CM FOR BREACH OF CONTRACT, FOR THE BREACH OF ANY WARRANTY OR FOR CM'S NEGLIGENCE OR IN STRICT LIABILITY.**

LIMITATION OF LIABILITY
CM shall have no liability for any damages if CM's performance is delayed for any reason or is prevented to any extent by any event such as, but not limited to: any war, civil unrest, government restrictions or restraints, strikes or work stoppages, fire, flood, accident, shortages of transportation, fuel, material, or labor, acts of God or any other reason beyond the sole control of CM. **CM EXPRESSLY DISCLAIMS AND EXCLUDES ANY LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGE IN CONTRACT, FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY, OR IN TORT, WHETHER FOR CM's NEGLIGENCE OR AS STRICT LIABILITY.**

OBTAINING WARRANTY PERFORMANCE
Normally, the contractor or service organization who installed the products will provide warranty performance for the owner. Should the installer be unavailable, contact any CM recognized dealer, contractor or service organization. If assistance is required in obtaining warranty performance, write or call:

Climate Master, Inc. • Customer Service • 7300 S.W. 44th Street • Oklahoma City, Oklahoma 73179 (405) 745-6000

NOTE: Some states or Canadian provinces do not allow limitations on how long an implied warranty lasts, or the limitation or exclusions of consequential or incidental damages, so the foregoing exclusions and limitations may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state and from Canadian province to Canadian province.

Please refer to the CM Installation, Operation and Maintenance Manual for operating and maintenance instructions.

Rev.: 11/09

LC083

Vertical Stack

Rev.: 11/09/12

Notes:

Notes:

Vertical Stack

Rev.: 11/09/12

Revision History

Date:	Item:	Action:
11/09/12	POE Oil Warning	Added
	Water Quality Standards Table	Updated
07/17/12	Wiring Diagrams and Matrix	Updated
01/03/11	Format - All Pages	Updated
7/26/10	Wiring Diagrams	Updated
06/11/10	Format - All Pages	Updated
01/11/10	816 Information	Removed
01/11/10	ECM-X Motor Information	Updated
11/05/09	Warranty	Updated
10/30/09	Functional Troubleshooting Table	Updated
09/15/09	Safety Features - CXM/DXM Controls	Updated
09/03/09	Optional Electric Heat and Minor Corrections	Added
07/29/09	Unit Commissioning & Operating Conditions	Data tables corrected
06/09/09	'Unit Starting & Operating Conditions' Section & Table	Edited and renamed 'Unit Commissioning and Operating Conditions'
04/16/09	Shipping Bracket Removal	Updated
04/16/09	Unit Start-Up Log Sheet	Added
04/16/09	Unit Operating Conditions Tables	Updated
02/24/09	Unit Operating Conditions and Coax WPD Tables	Added
02/05/09	All	Updated
09/09/08	Pressure Testing Note	Updated
06/30/08	Shut-Off Valve Note	Added to Ground-Water Heat Pump Applications
05/21/08	Pressure Testing Language Note	Added to Unit and System Checkout
01/01/07	First Published	

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